

Facilities Engineering

Transportation Infrastructure and Dams

**Headquarters
Department of the Army
Washington, DC
1 May 2000**

UNCLASSIFIED

SUMMARY of CHANGE

AR 420-72

Transportation Infrastructure and Dams

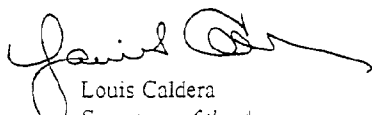
This revision--

- o Changes proponent for this regulation to the Assistant Chief of Staff for Installation Management (ACSIM) (Chap 1).
- o Replaces the term 'Director of Engineering and Housing (DEH)' with 'Director of Public Works (DPW)' as the installation activity responsible for facilities engineering, housing, and environmental services, hereafter referred to as DPW (Chap 1).
- o Deletes the requirement for an Internal Control Checklist (para 5, page 1).
- o Allows use of municipal, regional, and private service contractors where life cycle cost is less than owned and operated systems or where their use provides environmental, pollution control, and/or other operational advantages to the Army (para 1-5, page 3).
- o Encourages installation to participate in local and regional transportation planning organizations. (para 1-5, page 3) Chapter 3 on bridges has undergone major changes and it was switched with Chapter 4 on railroad trackage (Chap 3 & 4).
- o Provides a new Chapter 5 on installation dam maintenance and repair policy (Chap 5).
- o Revises the title of the regulation from 'Surfaced Areas, Bridges, Railroad Track and Associated Appurtenances' to 'Transportation Infrastructure and Dams' (Title page).
- o Includes guidance on Emergency Relief for Federally Owned Roads (ERFO) Program for funding repair to installation public roads and bridges damaged by natural disasters or catastrophic failures (Chap 1).

Effective 1 June 2000

Facilities Engineering

Transportation Infrastructure and Dams



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Secretary of the Army

History. This publication publishes a revision. Because the publication has been extensively revised, the changed portions have not been highlighted.

Summary. This regulation establishes policy, criteria, procedures, and standards for the operation, maintenance, and repair of Transportation Infrastructure, to include surfaced areas, railroad track, bridges, associated appurtenances, and dams.

Applicability. This regulation applies to

the Active Army and the U.S. Army Reserve. In areas outside the continental United States, it applies to other Federal departments and agencies that are tenants on an Army installation regardless of Service. This includes foreign official organization under joint use agreements, and any governmental or private organization licensed to operate within an Army installation. It does not apply to the Army National Guard, national cemeteries, Corps of Engineers civil works functions, and where the Army is a tenant of another Government agency.

Proponent and exception authority.

The Army proponent of this regulation is the Assistant Chief of Staff for Installation Management, (ACSIM). The authority to approve exceptions to this regulation, consistent with controlling laws and regulations, is delegated to the ACSIM Facility Policy Division, (DAIM-FDF), 600 Army Pentagon, Washington, DC 20310-0600. The Assistant Secretary of the Army (Installations & Environment) provides oversight to this regulation.

Army management control process.

This regulation is subject to the requirements of AR 11-2. It does contain internal control provisions in Appendix E.

Supplementation. Supplementation of this regulation and the establishment of command and local forms are prohibited without prior approval from Headquarters, Department of Army (HQDA), Assistant Chief of Staff for Installation Management, Facility Policy Division, (DAIM-FDF), 600 Army Pentagon, Washington, DC 20310-0600.

Suggested Improvements. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to HQDA, Assistant Chief of Staff for Installation Management, Facility Policy Division, (DAIM-FDF), 600 Army Pentagon, Washington, DC 20310-0600.

Distribution. This publication is available in electronic media only and is intended for command levels C, D and E for Active Army, Army Reserve, and U.S. Army Reserve.

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Chapter 1

General

1-1. Purpose

a. This regulation prescribes the Army Transportation Infrastructure and Dams administrative policies, procedures, and responsibilities for the Director of Public Works (DPW) to plan, program, and perform maintenance, repair, minor construction, quality assurance, and control of the following:

- (1) Paved roads
- (2) Airfields
- (3) Other surfaced areas
- (4) Culverts and other appurtenances
- (5) Railroad tracks
- (6) Bridges
- (7) Dams

b. The Army transportation infrastructure systems and dams policies are intended to provide safe, reliable, effective transportation systems and dams and ensure that maintenance and repair (M&R) work is completed in an efficient and cost effective manner.

1-2. References

Required and related references are listed in appendix A.

1-3. Explanation of abbreviations and terms

Abbreviations and special terms used in this regulation are listed in the glossary.

1-4. Responsibility

a. The Deputy Chief of Staff for Operations and Plans (DAMO-ODL) has the overall responsibility for motor vehicle traffic supervision in accordance with AR 190-5.

b. Maintenance, repair, minor construction of the Army Transportation Infrastructure, (pavements, railroad tracks, bridges, appurtenances), and dams on Army installations, together with the performance of related services are DPW activities and responsibilities. (See AR 415-15, AR 420-10 and DA Pam 420-11 for new construction guidance.)

c. Staff, command, and technical responsibilities for M&R of Army Transportation Infrastructure, (pavements, railroad tracks, bridges, appurtenances), and Dams will conform to assignments set forth in AR 420-10.

d. Installations shall assign a functional manager for each of the following functional areas; pavements, airfields, railroad trackage, bridges, and dams to act as the overall liaison.

e. Responsibilities for maintenance of facilities at continental United States (CONUS) and outside continental United States (OCONUS) installations is generally defined as follows:

(1) Within the 50 States, District of Columbia, and U.S. possessions-Installation facilities. The DPW will accomplish M&R of installation facilities and provide services to support these facilities using appropriated funds.

(a) Public facilities. According to Department of Defense (DOD) policy, military installations or activities will not accept responsibility nor provide funds for maintenance of any off-post public road. A road on a military reservation, which is opened to public traffic by permit, is not a public road and Army ownership is retained.

(b) Joint-use facilities. The extent and nature of Army maintenance of joint-use facilities will be governed by the terms of the controlling lease, permit, easement, or other agreement.

(c) Leased facilities. Maintenance responsibility for facilities on leased land will be governed by the terms of the lease, permit, easement, or other action conveying property rights and by the provisions of AR 405-45.

(d) Test roads and proof facilities. An installation commander having roads and other surfaced areas used exclusively for research and development activities or for development or testing of vehicles or equipment, when such tests require unusual surfaced areas, will assign operation and maintenance of such facilities to the research or test agency. The DPW may provide the needed operation and maintenance functions on a reimbursable basis.

(2) Outside the 50 States, District of Columbia, and U.S. possessions.

(a) Installation and joint-use facilities. The M&R of these facilities will be in accordance with the terms of the agreements or treaties with host countries.

(b) Public or private facilities. M&R of these facilities will be funded by the Army only when the work is necessary to satisfy U. S. requirements and an agreement has been executed with the owner of the facility authorizing right of U.S. entry and use of the facility.

1-5. Policy

a. Army policy is to provide safe, reliable, efficient, and cost effective transportation infrastructure systems and dams that promote the health and welfare of the soldiers, civilian employees, their families, contractor workforce,

retirees, and provide the capability for installations to accomplish assigned missions. The Army of the future (FORCE XXI) is a Power Projection Army that depends on its transportation infrastructure systems and dams as an essential mission component.

b. Installations, where life cycle cost effective, are to obtain transportation infrastructure services and dams from local, municipal, or regional (public and/or private) authorities rather than expand, build or operate and maintain Army owned transportation infrastructure systems and dams.

c. Environmental considerations, legal liabilities, manpower shortages, and reduced funding for operation and mission requirements can make it more advantageous for the Army to obtain transportation infrastructure services and dams from local, municipal, regional and private service contractors.

d. Installations should participate in local, municipal, and regional transportation planning and dam safety organizations.

e. The use of local, municipal, or regional (public and/or private) transportation infrastructure systems and dam safety, where the life cycle cost exceeds that of an Army owned system requires approval by the ACSIM.

f. Life cycle cost analysis, to determine the most cost-effective approach, will be performed in accordance with AR 11-18 and the Memorandum of Agreement on Criteria/Standards for Economic Analyses/Life Cycle Costing for MILCON Design.

g. In providing transportation infrastructure and dam safety services, Army installations will comply with all applicable Federal laws and regulations. Applicability of State and local laws and regulations to installation transportation infrastructure and dam safety will be referred to the installation Staff Judge Advocate General for interpretation.

h. OCONUS Army installations will comply with the Final Governing Standards (FGS) issued by the Department of Defense (DOD) Executive Agent for the host nation concerned. The FGS may be predicated on the Overseas Environmental Baseline Guidance Document. DOD Directive 6050.16 authorizes the Executive Agent to establish and enforce environmental compliance standards.

i. Environmental protection and enhancement and hazardous, toxic, and radioactive waste management will be in accordance with AR 200-1.

j. All excavations (regardless of by whom made) will be coordinated with the installation DPW.

1-6. Emergency Relief for Federally Owned Roads (ERFO)

a. The ERFO Program provides funding assistance for the repair of installation roads and bridges that are open to the public and are damaged by natural disasters or catastrophic failures. Army roads open to public travel are defined in glossary.

b. The ACSIM Facilities Policy Division will provide Army oversight and guidance to implement the ERFO Program. The Military Traffic Management Command (MTMC) coordinates the ERFO Program for DOD in conjunction with the Federal Highway Administration (FHWA). The FHWA publication, 'Emergency Relief for Federally Owned Roads Disaster Assistance Manual', # FHWA/FLP98/005 provides details on the ERFO process, the types of eligible repairs, and how to apply for ERFO funding. The manual is available from, FHWA (HFL-1), 400 Seventh Street, SW., Washington, DC 20590-0400.

Chapter 2 Pavements

Section I Policies and Procedures

2-1. Introduction

a. The general policy is to manage pavements to accomplish the purpose of this regulation established in Chapter one, by periodically assessing the condition of the pavement network, establishing work plans to reach and maintain predetermined facility conditions, and developing maintenance strategies to make the best use of available maintenance dollars. Preventive maintenance will be systematically applied to protect pavement investments and prolong its life.

b. Concerted and continuing efforts will be directed toward accurate and complete identification, validation, programming, budgeting, and execution of all M&R requirements.

2-2. Pavement policies

a. A triennial on-site review of the installation's pavement maintenance program by the Major Army Command's (MACOM) engineer staff is required.

b. Planning should provide for maintenance of pavements and appurtenances at an economical level considering life cycle costs and traffic through the use of a Pavement Condition Index (PCI) as defined in TM 5-623. The PCI rating is based on a scale of 0 to 100, which is an indication of the pavement's surface operational condition and structural

integrity. Pavement surface distresses, utilized in determining the PCI, are not to be utilized to assume structural strength and load carrying capacity. Non-Destructive Testing (NDT) is required to determine actual strength and capacity. New and rehabilitated pavements will be maintained above the minimum levels indicated in paragraph 2-5 through an effective preventive maintenance program. All preventive and safety related pavement maintenance shall be identified as an Annual Recurring Requirement (ARR).

2-3. Work classification

a. General. The facilities, other than family housing, have M&R work and minor construction classification defined in AR 420-10. Unspecified Minor MCA (UMMCA) and Military Construction Army (MCA) programs are described in AR 415-15. The DA Pamphlet 420-11 and the definitions that follow, provide guidance for determining work classifications.

(1) *Roads and streets.* In accordance with Army facility classes and construction categories found in AR 415-28, all real property improvements contained in the installation real property records under the three digit category codes 851 (roads) or 852 (sidewalks and other pavements) will each be considered a single real property facility (RPF) for the purpose of work classification.

(2) *Airfield pavements.* For airfield pavements, Category 110, all adjoining airfield pavements represent a single RPF, and items such as runways (Category 111), taxiways (Category 112), and aprons (Category 113) may be considered as component parts of this RPF. Real property accounting will be in accordance with AR 405-45.

b. Work classification categories.

(1) *Maintenance.* This classification of work is usually performed on paved areas with a PCI greater than the minimum levels indicated in paragraph 2-5. The maintenance of roads, airfields, and other surfaced areas encompasses primarily the day-to-day routine and/or preventive work. Maintenance includes items such as sealing cracks and joints, repairing potholes, patching, repairing spalls, applying pavement rejuvenators, and other normal day-to-day operations. Removal of debris and silt, and grading and seeding of drainage ditch side slopes are also examples of maintenance. The types of work, which are classified as maintenance, are listed under the work designation codes in figure 2-1.

(2) *Repair.*

(a) The repair of roads, airfields, and other surfaced areas is the restoration of a failed or rapidly deteriorating section to a good or excellent condition or at least to such a condition that it may be utilized for its designated purpose. Repair is normally applied to pavements with a PCI less than the minimum levels indicated in paragraph 2-5.

(b) Repair work includes recycling, applying overlays, slab replacement, and repairing drainage systems. Paving of the invert only of an open drainage ditch and placement of erosion control measures such as riprap and gibbons are properly classified as repair.

(c) If a roadway segment is repaired by replacement, localized changes in alignment is properly classified as repair in order to correct safety deficiencies, accommodate current geometric design standards (curvature, sight, distance) or improve traffic flow.

(d) An increase in roadway lane width is properly classified as repair if it is accomplished incident to major repairs of the pavement segment and is required to meet geometric design provisions in TM 5-822-2. The types of work, which are classified as repair, are listed under the work designation codes in figure 2-1.

(3) *Construction.* Construction of roads, airfields, and other surfaced areas relates to the alteration, extension, replacement, or upgrading of an existing single RPF. Work includes that which increases base data by widening or lengthening a surfaced area; relocating a road or other facility in its entirety; strengthening a pavement to support a new mission; replacement of an entire facility; and installation of additional appurtenances such as drainage structures, and curb and gutter, unless accomplished as part of major repairs. Any extensions to storm drainage systems to accommodate curbs and gutters is classified as construction, as is the improvement of an unimproved area with subbase, base, wearing surface, and drainage or the overlay of an unsurfaced pavement with bituminous or portland cement concrete. Paving of sidewalks only of an open drainage ditch is construction. The types of work, which are classified as construction, are listed under the work designation codes in figure 2-1.

Section II

Levels of Performance for Pavements

2-4. Introduction

a. Pavements. The following PCI levels establish minimum acceptable pavement service levels.

(1) Installation vehicular pavements shall be maintained to at least the following PCIs:

(a) Primary roads - 60.

(b) Secondary roads - 50.

(c) Tertiary roads - 45.

(2) Installation airfield pavements shall be maintained to at least the following PCIs:

(a) All runways - 71.

(b) All primary taxiways - 60

(c) All aprons and secondary taxiways - 56.

(3) The following PCI rating ranges for vehicular pavements, as defined in TM 5-623, shall be used for the Installation Status Report (ISR) ratings:

(a) PCI rating 56-100 equals an ISR Green rating.

(b) PCI rating 41-55 equals an ISR Amber rating.

(c) PCI rating 0-40 equals an ISR Red rating.

(4) The following PCI rating ranges for airfield pavements, as defined in TM 5-623, shall be used for the Installation Status Report (ISR) ratings:

(a) PCI rating 71-100 equals an ISR Green rating.

(b) PCI rating 56-70 equals an ISR Amber rating.

(c) PCI rating 0-55 equals an ISR Red rating.

b. Drainage facilities.

(1) Drainage channels, ditches, storm sewers, sub-drains, and culverts will be maintained to function at full design capacity.

(2) Catch basins, drop inlets, manholes, and storm sewers will be cleaned to properly function. Rodding, auguring, flushing, and other nondestructive cleaning methods may be used as shown in TM 5-665.

(3) Storm water lift or pump stations and force mains will be maintained in a fully operational condition. Operation and maintenance guidance is provided in TM 5-665 and TM 5-666.

(4) Ditches will be kept clean and well graded. Where erosion is a problem, devices such as silt fences, erosion control fabric, and silt basins may be used to control runoff and allow establishment of vegetation. Paved ditches may be used where vegetation cannot be established or would impede suitable drainage.

(5) Curb and gutter may be installed where required for adequate drainage and to control shoulder erosion where ditches will not suffice. Where curbs are to be replaced through an area that includes a pedestrian cross walk, curb-drops and ramps will be constructed for access by the physically disabled.

c. Shoulders. Shoulders will be maintained to design template, to allow satisfactory surface drainage and to protect the pavement edge. Edge ruts will be repaired to prevent hazardous situations for errant vehicles. Shoulders may be paved when necessary for safety, dust or erosion control, or protection of the pavement edge.

d. Traffic control devices. Signs, signals, pavement markings, and other traffic control devices will be kept legible and operating in accordance with the current Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) or host criteria, as appropriate, to control and safeguard traffic.

e. Snow removal and ice control. Erection of snow fences and markers, removal of snow, and application of chemicals and abrasives for ice control will be performed as necessary to maintain traffic. Guidance on maintenance procedures is provided in TM 5-624.

f. Bridge. Bridge deck overlays are prohibited unless approved by a structural engineer. Copies of the approval are to be placed in a permanent bridge file.

Section III

Pavement Management Procedures

2-6. Introduction

The PAVER pavement management system described in TM 5-623 provides engineering analysis tools for development of short and long range maintenance programs and for project development. Upward communications (installation, Major Subordinate Command (MSC), MACOM, ACSIM), including program presentation, and project justification, will utilize the standard terminology and pavement management concepts contained in TM 5-623.

2-7. Facilities inventory of pavement network

a. The installation pavement network consists of all surfaced areas, which provide accessways for ground or air traffic, including roadways, parking areas, hardstands, storage areas, and airfield pavements. The network will be inventoried and divided into manageable sections for performing pavement inspections and determining M&R needs. The Integrated Facility System (IFS) numbers and PAVER branch numbers should be the same.

b. Installations shall maintain an inventory map, showing all traffic control signs and signals.

2-8. Condition inspection of pavement network

a. Qualified technical personnel will make inspections of pavements and appurtenances for determination of maintenance, repair, and construction requirements. (See Appendix D for qualifications.) Inspection techniques and distress identification described in TM 5-623 will be used for this purpose. The frequency is to be based on individual section condition and rate of deterioration, but in no case will the time between inspections exceed 3 years. Network level inspections should be accomplished, on a random sampling basis, with an average of not less than ten percent of the total sample units within a section. Airfield evaluations performed under the airfield evaluation program in TM 5-826-6

may be used to satisfy the inspection requirements for airfields. Reports generated from these inspections shall be used for checking problem areas during subsequent or intervening inspections and for project development.

b. Installations and MACOMs shall program for re-inspections and this should be funded as part of the ARR. Resources for inspections and re-inspections should be derived from the surfaced areas operations and maintenance account.

c. Category I Army airfields, that are defined as critical by U.S. Army Aeronautical Services Agency (USAASA), should have a pavement condition survey and a structural evaluation including non-destructive test (NDT) evaluation performed every 5 years. Category I airfields not classified as critical, and instrumented heliports, should have a pavement condition survey every 4 years and a structural evaluation including NDT performed every 8 years. Category II airfields should have a pavement condition survey every 4 years. The NDT evaluations for Category II airfields should be on an as needed basis. See AR 95-2 for the definitions of Category I and II airfields. Airfield pavement evaluation procedures and NDT procedures for Army airfields are described in the TM 5-826 series. In addition, an out of cycle pavement condition survey and/or structural evaluation including NDT should be performed with each mission change, when the pavement shows signs of structural distress, or after a reconstruction project.

d. Airfield pavement evaluations are managed by installation DPW. Information concerning aircraft inventory, aircraft passes and aircraft operations, including portions of the airfield pavement evaluation reports containing references to aircraft inventory, passes and operations, shall not be released outside U.S. Government agencies.

e. Vehicular traffic signs, signals, pavement markings, and delineators will be inspected at least twice per year to ensure conformance with the latest edition of the MUTCD or with host country standards for OCONUS installations.

f. Air traffic control signs, signals, pavement markings, and delineators will be inspected based upon requirements determined in coordination with the installation airfield commander/manager.

2-9. Network level management

Network level management encompasses management activities associated with the total pavement network. The following minimum network management activities will be accomplished in development of both the 5-year plan and annual work plan (AWP).

a. Use of a priority or optimization scheme to decide when individual pavement sections should be maintained or repaired within budgetary constraints.

b. Development of a program and budget for M&R of the pavements.

2-10. Work planning

The installation Resources Management Plan (RMP) is a consolidation of all DPW developed plans into a single integrated plan that reflects all major requirements, initiatives, actions and objectives at least 5 years into the future. Routine pavement M&R shall be incorporated into the installation RMP.

a. Annual Work Plan. The AWP for paved areas shall identify the ARR and major M&R planned for accomplishment in the program fiscal year and contains the following:

(1) The ARR includes the routine pavement maintenance tasks shown in table 2-1. These tasks should be accomplished on an annual basis to preserve the integrity of the pavement structure, prevent more costly M&R treatments, and to assure traffic safety. Tasks identified within the ARR should be fully funded on an annual basis. Separate Individual Job Orders (IJO's) which include specific task description and location, the unit of measure and unit cost, will be prepared to facilitate orderly planning, review, and analysis.

(2) The major M&R portion of the AWP will be developed based on comparison of major M&R alternatives. Prioritization of major M&R projects should be based upon cost, type of repair, pavement condition, and realistic budget levels. (See TM 5-623 for M&R alternatives guidance.)

(3) Five-year long-range plan. Long-range plans will be developed for a 5 year period by year and consist of the level of anticipated ARR work requirements and a network level M&R project list. *c.* Snow removal and ice control plan. At installations where snow and ice accumulate on roads or airfields, a snow removal and ice control plan will be prepared. The plan should include all roads and airfields identified by priority for clearance, equipment and materials needs such as snow fences, chemicals, abrasives, and arrangement for military troop work and other emergency planning measures as determined necessary by the DPW.

b. *Conformance to master plan.* Minor construction projects for roads, airfields, and other surfaced areas will conform to the Master Plan for the installation in accordance with AR 210-20.

2-11. Project level management

Project level management encompasses detailed engineering management associated with the M&R of specific pavement sections. Management decisions should be based on:

a. *Pavement inspection.* A detailed pavement inspection should be completed which involves a distress survey, estimating remaining life, and noting any safety problems. The inspections should determine the cause of failure and appropriate corrective actions. PAVER can be used to assist in this investigation. Consideration should be given to the

adequacy of the drainage system since water infiltration is a primary cause of several distresses. NDT evaluation may be warranted to determine structural adequacy.

b. Development and selection of alternatives. Pavement M&R alternatives should be developed for each pavement section (See TM 5-623 for details.) Project selection should be based on the lowest life cycle costs and overall road serviceability factors. Pavement recycling should be considered for all asphalt concrete pavement projects involving overlays, replacement of asphalt concrete, or corrections in the geometry of the pavement cross-section. Recycling will be included in the bid document as an optional alternative unless it has been determined to be an unacceptable repair/construction alternative.

c. Project analysis. Documentation of project analysis shall be included in the project files for each pavement project over \$50,000. Documentation should consist of a record of data relevant to the project, including a life cycle cost analysis of each feasible alternative developed. Relevant data should include the following:

- (1) Project title/description.
- (2) Project location.
- (3) Facility/branch/section number(s).
- (4) Category code (5-digit).
- (5) Facility/branch use(s).
- (6) Surface type(s).
- (7) Pavement rank(s).
- (8) Pavement dimensions / area.
- (9) Pavement age(s).
- (10) Pavement Condition Index (PCI).
- (11) Type and quantity of pavement distress.
- (12) Repair alternatives considered.
- (13) Life-cycle economic analysis for each alternative.

d. PAVER reports. Project information relating to pavement sections can easily be retrieved from the PAVER reports. PAVER has a life-cycle economic analysis report that can be used to determine the Equivalent Uniform Annual Cost (EUAC). The family analysis report in PAVER can be used to predict life expectancy for different types of pavements.

e. Pavement load carrying capacity analysis. After pavement inspections, those pavements experiencing load-related distresses should be evaluated structurally by field sampling or NDT. Testing and reinspection should be repeated if there is a change in traffic mission; distress types indicating further load related distresses; or presence of structural distress. Pavements particularly susceptible to frost and spring thaw damage will be posted as to load and speed limitations during the spring thaw season. These roads may be temporarily closed to traffic if a structurally adequate alternate route in the area exists.

f. Preliminary design. A qualified engineer with pavement experience will develop maintenance, repair, and construction projects using the AWP as the source for work requirements.

2-12. Project validation

a. All M&R projects submitted to for DA approval will go to ACSIM Facility Policy Division, (DAIM-FDF), 600 Army Pentagon, Washington, and DC 20310-0600. Projects will be thoroughly reviewed by the MACOM and operating agency commanders to validate work classification and scope of work. Project documentation will include that prescribed in AR 420-10 and DD Form 1391 (FY, Military Construction Project Data). For a single undertaking involving more than one classification of work, costs applicable to each classification of work are to be considered separately with reference to limitations and approval authority.

b. For all pavement projects, a project folder should be maintained by the DPW and include a cost estimate with life cycle cost analysis, PCI data, an analysis of alternatives, justification for project selection, a completed DA Form 4283 (Facilities Engineering Work Request), and rationale for classification of the project.

2-13. Project approval

Projects will be approved in accordance with AR 420-10, AR 415-15, and MACOM and MSC policies.

2-14. Project plans and specifications

a. Personnel qualifications. A qualified engineer with experience in pavement and drainage should be used for all pavement and drainage design. The DPW shall be responsible for a quality assurance (QA) check of all plans and specifications.

b. Design criteria. The DPW will use current design criteria and guide specifications for the design of M&R projects involving pavements and appurtenances, unless otherwise stated below.

(1) *Vehicular pavements.* Pavement thickness design criteria shall be used for all pavement structural design. With the exception of pavement thickness design, local state highway specifications may be substituted for Corps of

Engineers Guide Specifications (CEGS) for those pavements having a design index of four or less, (See TM 5-822-2 for details).

(2) *Airfield pavements.* Evaluation, engineering, and thickness design procedures for Army airfield pavements shall be accomplished in accordance with TM 5-800 series. Airfield material requirements and mix designs will be in accordance with appropriate CEGS and technical manuals. State highway specifications shall not be used for airfield pavements.

(3) *Drainage facilities.* Design of drainage facilities will be in accordance with the TM 5-820 series. Design of drainage facilities will not be based on pure judgment.

c. Materials and specifications. Materials and specifications used in the performance of maintenance, repair and minor construction work will conform to the applicable Federal, military, State, American Association of State Highway and Transportation Officials (AASHTO), American Society for Testing and Materials (ASTM), and other recognized national or host nation industry and technical society specifications and standards. Aggregates or other materials found in local deposits and proven acceptable by laboratory tests and with established history of acceptable performance should be used in pavement maintenance, repair, and construction whenever feasible as long as the local materials meet requirements of appropriate CEGS and technical manuals.

(1) *Highway pavements.* For a design index of four or less (TM 5-822-2), materials conforming to state highway specifications may be used in vehicular pavements to permit the use of local materials and practices. At OCONUS sites, use of host country specifications is acceptable.

(2) *Airfield pavements.* Design of heliports and airfields shall conform to CEGS. Materials conforming to state highway department specifications shall NOT be used in the design of airfield pavements. Because of the heavy wheel loads and high tire pressures imposed on airfield pavements, a more stringent asphalt concrete design mix is required for airfields than for vehicular pavements. State highway standard specifications do not meet density and stability requirements for aircraft traffic, and the use of such specifications may result in poor pavement performance. The skid resistance of airfield pavements can be reduced with the use of bituminous treatments.

(3) *Testing.* Materials will be inspected, tested, or certified to the degree necessary to ensure compliance with authorized specifications and standards. Asphalt concrete material to be recycled shall be tested to determine recycling feasibility and optimal design mix.

(4) *Quality control.* All M&R projects exceeding \$100,000 shall contain Contractor quality control plans that address materials specification and use, specifically stating required testing and certification. The Contractor's quality control plan should provide for Contractor inspection and certification that materials incorporated in the works meet specifications.

2-15. Traffic engineering

a. Traffic Management. The day-to-day management of traffic and the enforcement of traffic laws and regulations is the responsibility of the Provost Marshal / Security Officer (PMO). Planning, design, and erection of signs, signals, pavement markings, and other traffic control devices should be based upon traffic engineering studies and are the responsibility of the DPW. The PMO will provide the DPW with Accident Record Reports on a routine basis.

b. Accident reduction program. The DPW shall develop an accident monitoring and reduction program to include filing accident records by location, determining high accident locations and patterns, determining probable causes, and development of projects to eliminate accidents. The DPW shall immediately notify MTMC/TEA of all motor vehicle crashes occurring on installation roadways that involve fatalities and severe injuries. MTMC/TEA will determine if the crash warrants an onsite investigation of the road environment by MTMC/TEA engineers.

c. Studies. Traffic engineering studies will be performed in accordance the Institute of Transportation Engineers publication, Manual of Traffic Engineering Studies. Traffic engineering measures and techniques shall be used to reduce the number and severity of traffic accidents in accordance with AR 55-80. The DPW will develop traffic engineering capabilities in-house, through contractors, or through MTMC conducting formal traffic engineering studies. Assistance in performing traffic studies will be requested through MACOMs to MTMC using DD Form 1948 (Traffic Engineering Needs Report). MTMC can also assist in the selection of a contractor.

d. Standards and criteria. Surfaced areas on Army installations will have regulatory, warning, and guidance signs; signals, pavement marking, islands, and delineators, which meet MUTCD or host nation standards and criteria. At CONUS installations, approval to use non-standard devices must be obtained from MTMC prior to use. Requests must contain full justification and rationale for waiver from criteria in the MUTCD.

e. OCONUS installations. The OCONUS installation streets and roads are to be considered an extension of the road system of the host country and shall use traffic control device standards and criteria of the host country.

f. Traffic control devices. The DPW is responsible for the purchase, installation, maintenance, and repair of all traffic signs, signals, and pavement markings except those associated with new construction. Provision for traffic control devices in new construction projects should be included in the construction contract. Signs, signals, pavement markings, and other traffic guide and control devices will be kept legible and/or operating as necessary to regulate and safeguard daytime and nighttime traffic. All signs on CONUS installations must conform to the MUTCD. Design of

new or replacement traffic signal systems will be reviewed, through the MACOM, by MTMC-TEA, Newport News, VA 23602.

g. Pavement markings. The titles discussed below are two types of pavement markings.

(1) *Thermoplastic markings.* Thermoplastic materials are recommended only when economically justified and the pavement does not require overlaying in the foreseeable future. Raised markers, metal and plastic inserts, and small metal or plastic studs with inserted reflectors, which conform to CEGS, are recommended only where safety dictates. Where these devices cause interference with snow removal operations or cause a maintenance problem as a result of snow removal operations, their use should be restricted to the most critical areas. When reflectors are required in common snow areas, recess reflectors should be used.

(2) *Army airfield and heliport pavement marking.* Design of airfield and heliport pavement marking patterns and materials used will conform to provisions of TM 5-823-4. Thermoplastic materials, metal and plastic inserts, and small metal or plastic studs with inserted reflector buttons shall not be used since they may become dislodged.

2-16. Snow removal and ice control

a. DPW. The DPW will develop a snow removal and ice control plan as described in paragraph 2-10(c). Occupants of family quarters, barracks, and operators of non-appropriated fund facilities are responsible for the removal of snow and ice from walks, steps, landings, private drives and parking areas, and similar areas adjacent to the building or activity.

b. Snow removal policy. Installations may implement a snow removal policy where warranted, that maintains specific pavements free of snow or ice accumulation. This high level of service is normally obtained by the heavy use of chemicals and frequent plowing and may be required for the following locations:

- (1) Airfield pavements.
- (2) Primary entrance roads.
- (3) Intersections with high accident rates.
- (4) Railroad crossings.
- (5) Long or steep grades.
- (6) Bridges.
- (7) High volume pedestrian walks.

c. Materials.

(1) Calcium chloride, sodium chloride, and abrasives may be used on roads and other vehicular surfaced areas for snow and ice control. Use of chemicals will be kept to a minimum in order to reduce environmental impacts. Covered storage will be provided for all chemicals to prevent loss to the environment. Neither calcium chloride nor sodium chloride will be used on airfield or heliport pavements.

(2) Urea meeting provisions of military specification MIL-U 10866C, Class 2, or U.S. Air Force aircraft deicing fluid meeting the provisions of military specification MIL-D-83411 may be used on airfield and heliport pavements. These materials are non-corrosive to aircraft materials, however, urea is highly destructive to some concrete pavements. Therefore, the application rate for urea should not be exceeded.

(3) The use of chemicals, deicers, or other material to remove snow and ice must comply with applicable federal, state, and local environmental laws and regulations when conducting such operations.

2-17. Safety

a. Work zone traffic control. Necessary safety measures will be taken on roads and airfields to safely control and provide for traffic during M&R. These measures will be taken during all condition inspections, maintenance, repair, and construction operations by both in-house and contract forces.

b. Safety hazards. Hazardous features such as transverse ridges, speed bumps, or dips on pavement surfaces will not be installed or maintained as a means of controlling or reducing the speed of traffic. Roadside obstacles or high embankments will be evaluated for safety. Roads with substandard geometric design will have an engineering analysis performed to determine the need for correction.

2-18. Quality assurance

The inspection of maintenance, repair and construction work in progress, whether by in-house forces, or architect / engineer (A/E) services will be on a timely basis with special attention to quality assurance. Quality assurance inspections will be made on surfaced area work and will be commensurate with the work performed. Random monitoring may be used for work performed in-house or by an operating contractor. Continuous inspection should be provided for work performed by an outside contractor. Inspectors should demonstrate knowledge of proper maintenance, repair and construction procedures.

2-19. Record keeping and project closeout

a. In addition to retaining the project folder items listed in paragraph 2-12, the following steps will be followed when closing a project upon completion of work and maintaining a permanent record for every project:

b. The PAVER database will be updated to reflect changes in network inventory, pavement condition, and unit cost figures.

c. Real property records and IFS-M database will be updated.

d. A final project warranty inspection will be conducted before the warranty on the work expires. A record of this inspection will be retained in the project folder.

2-20. Coordination

Open lines of communications should be maintained between project planners, designers, and inspectors at the network and project levels to provide information regarding pavement performance. This information should be used in development of preliminary M&R strategies at the network level and to modify future designs at the project level.

2-21. Disposal

Action will be taken to dispose of pavements and appurtenances for which there is no foreseeable need in accordance with AR 405-90.

Table 2-1
Routine Pavement maintenance Maintenance Tasks

BITUMINOUS PAVEMENTS	CONCRETE PAVEMENTS	UNSURFACED AREA	DRAINAGE	TRAFFIC CONTROL	INSPECTION
Crack sealing	Crack sealing	Grading	Cleaning culverts	Pavements striping	Network level inspection
Pothole repair	Joint sealing	Dust control	Ditch maintenance	Sign maintenance	Detailed project level inspection
partial depth patch	partial depth patch (bonded)	Snow removal and ice control	Catch basin cleaning	Sign maintenance	Nondestructive testing and/or laboratory testing
Full depth patch	Full depth patch		Erosion	Guardrail maintenance	
Lane/Shoulder dropoff	Snow removal and ice control		Slope protection	Impact attenuator maintenance	
Surface seals			Storm drains		
Surface treatment					
Snow removal and ice control					

Surfaced Area Maintenance

- (SM-1) Blading, dragging stabilized surfaces
- (SM-2) Cleaning and seeding open drainage ditches, culverts, inlets, and manholes
- (SM-3) Cleaning and sealing cracks and joints
- (SM-4) Slab undersealing
- (SM-5) Snow removal and ice control ("M account")
- (SM-6) Snow fence erection or removal ("M account")
- (SM-7) Vegetation control
- (SM-8) Erosion control
- (SM-9) Repainting pavement markings
- (SM-10) Cleaning, refacing, and maintaining traffic signs
- (SM-11) Dust palliative application
- (SM-12) Seal coat, asphalt rejuvenation, or surface treatment on paved surfaces
- (SM-13) Scarifying, reshaping, compacting and adding new material to stabilized areas
- (SM-14) Spot or localized milling
- (SM-15) Grinding PCC pavements
- (SM-16) Maintenance of retaining walls
- (SM-17) Street Sweeping ("M account")

Surfaced Area Repair

- (SR-1) Surface recycling
- (SR-2) Restoration of load transfer across joints and cracks in PCC pavements
- (SR-3) Overlays to improve skid resistance (TM-823)
- (SR-4) Milling to remove surface or re-establish profile
- (SR-5) Recycling
 - A. Surface B. Hot-Mix C. Cold-in-place
- (SR-6) Overlays to improve surface roughness or profile
- (SR-7) Structural overlays to accommodate normal growth and evolution of mission, equipment and facilities
- (SR-8) Replacement of failed drainage systems, failed curb and gutter
- (SR-9) Paving of the invert only of an open drainage ditch and placing riprap and gibbons
- (SR-10) Placement of new PCC curbs and gutters which are added incidental to major street and parking lot repairs and required for protection of the pavement edge and reduced pavement/shoulder maintenance.
- (SR-11) Patching paved surfaces
- (SR-12) Replacement of traffic signal lights

Surfaced Area Construction

- (SC-1) Replacement of entire facility (see para 2-3a for definition of "single real property facility")
 - (SC-2) Widening/lengthening a surfaced area (see exception, para 2-3b (3))
 - (SC-3) Relocating a roadway (see exception, para 2-3b (3))
 - (SC-4) Strengthening of pavement to accommodate a new mission (but, see SR-7 above)
 - (SC-5) Installation of additional appurtenances (see exception, SR-9 above)
 - (SC-6) Any extension of storm drainage systems to accommodate new curbs and gutters
 - (SC-7) Improving an area from its natural condition by mechanical compaction, addition to subbase, base course, and/or a flexible or rigid wearing course.
 - (SC-8) Paving of sidewalks only or paving sidewalks and the invert in one project as one undertaking
- This list is not all inclusive, but rather it contains types of work which are commonly performed in order to maintain, repair and construct surfaced areas.

Figure 2-1. Work Designation Codes-Pavement

Chapter 3

Railroad Track

Section I

Policies and Procedures

3-1. Introduction

The general policy is to manage railroad trackage to accomplish the purpose of this regulation established in Chapter one, by periodically assessing conditions of the railroad network, establishing work plans to reach predetermined

facility conditions, and developing maintenance strategies to make best use of available maintenance dollars. Preventive maintenance will be systematically applied to protect railroad investments. The DPW is responsible for the inspection, maintenance, repair, and improvements to railroad track located on Army installations and Army-owned access tracks. The responsibilities on privately owned but Army used railroads on leased land will be governed by the terms of the lease, permit, easement or other action conveying property rights, and the provisions of AR 420-17. Improvements, extensions, and construction are to be accomplished as minor construction, if total project cost is \$300,000 or less, as defined in AR 420-10; or as a Unspecified Minor MCA (UMMCA) or Military Construction Army (MCA) project, as defined in AR 415-15. The operation and maintenance of rolling stock on Army tracks, except for motor cars and machines used for track M&R, is not a DPW responsibility.

3-2. Railroad policies

a. Introduction. For all CONUS installations, the minimum required condition levels for Army railroad track are provided in TM 5-628, Railroad Track Standards. Host nation safety standards (if greater than TM 5-628) shall continue to apply to railroad trackage at all OCONUS sites. TM 5-628 shall be used for the inspection and routine maintenance of Army CONUS railroad track. Track inspection and routine maintenance programs for OCONUS sites may be done in conformance with TM 5-628, but no instance less than the host nation standard. The standards in TM 5-628 are not intended to be used as specifications for new construction or major track rehabilitation projects. TM 5-850-2 and AREA 'Manual for Railway Engineering' and/or host nation industry & government standards will continue to apply to new construction and to complete reconstruction of segments of existing facilities.

b. Track classification. All track will be classified and maintained under one of the following categories:

(1) *Category A.*

(a) Active main lines, or

(b) Any track where the operating speed exceeds 10 mph.

(c) Track (both active and inactive) required for mobilization and where the operating speed will exceed 10 mph.

(2) *Category B.*

(a) Active passing tracks, loading tracks, classification yard tracks, and storage tracks.

(b) All other tracks (both active and inactive) required for mobilization and not previously identified as Category A track.

(c) Tracks having an occasional use or a foreseeable need.

(3) *Category C.* Inactive track with no current mission requirements.

c. Establishing track categories. The installation DPW and the Directorate of Logistics (DOL) designate a track category for each track. Once track categories are designated, a set of track maps shall be marked to identify the appropriate categories. Track categories should be updated whenever a change in an installation's mission affects its railroad track.

d. Condition levels. The following track condition levels indicate the relative seriousness of defects, allows for comparison of defects, and establishes priorities repair work:

(1) *Full compliance.* Track meeting all of the requirements of the standards. Track at this level has only minor defects and should be capable of handling all train operations. Routine maintenance is required to maintain this condition level and repair work will generally be minor.

(2) *10 MPH.* This condition level represents track that has defects serious enough to make it unsuitable for operation greater than 10 mph, essentially 'normal yard speed'. Track at this condition level is considered marginal.

(3) *5 MPH.* This condition level represents track that has defects serious enough to make it unsuitable for operations greater than 5 mph. This level is intended as a warning to indicate track that is approaching a condition that will require removal from service.

(4) *No operation.* Track which has defects serious enough to require removal from service. At this level the operation of trains over the track is generally considered hazardous and operations shall not be allowed, excepts as noted in TM 5-628.

e. Minimum required condition levels. The minimum required condition level for various track categories are as follows:

(1) A - full compliance.

(2) B - 10 MPH.

(3) C - as specified in TM 5-628.

f. Operation restrictions. TM 5-628 identifies track safety conditions, which require restriction or suspension of train operations, and establishes minimum required condition levels for Army track. Track restriction or suspension procedures shall be applied as outlined in TM 5-628, immediately upon discovery of the substandard condition.

g. Preventive maintenance. Preventive maintenance of railroads and appurtenances should provide a means for early detection of any apparent deterioration of the facility. Routine track inspections shall be considered a preventive maintenance activity.

h. A triennial. A triennial on-site review of the installation's railroad track maintenance program by the MACOM engineer staff is required.

3-3. Work classification

a. M&R work and minor construction are defined in AR 420-10; Unspecified Minor Military Construction Army (MCA) and MCA programs are described in AR 415-15.

b. Guidance for determining work classification is found in the above regulations in conjunction with DA Pamphlet 420-11 to provide examples of maintenance, repair, and a minor construction projects and proper work classification.

c. In accordance with Army facility classes and construction categories found in AR 415-28, real property improvements contained in the installation real property records under the three digit Category code 860 are be considered to be a single RPF for work classification.

d. Work classification categories.

(1) *Maintenance.* Maintenance includes those actions required to prevent track deterioration or to correct minor defects. The types of work which are classified as maintenance are listed in the work designation codes in figure 3-1.

(2) *Repair.* Repair includes those actions necessary to restore the track segments to a safe and efficient operating condition consistent with category of track and traffic carried. The types of work which are classified as repair are listed in the work designation codes in figure 3-1.

(3) *Construction/alteration.* Construction/alteration includes those actions involved in changing track alignment or new track involving an increase to the installation rail network, (the placement of track where none existed before). Localized changes in alignment are properly classified as repair to accommodate current geometric design standards (curvature) if accomplished incidental to other major repairs to the track structure. The types of work which are classified as construction/ alteration activities are listed in the work designation codes in figure 3-1.

Section II

Levels of Performance for Railroad Track and Railroad Management Procedures

3-4. Performance standards

Army railroad track at all CONUS installations will be maintained at or above the minimum condition levels specified herein and technically defined in TM 5-628. This assures that trackage can support Army missions, and effects systematic track maintenance which will protect current and future rehabilitation investments. Host nation safety standards, (if greater than TM 5-628), shall continue to apply to railroad trackage at all OCONUS sites. However, track inspection and routine maintenance programs for OCONUS sites should be done in conformance with TM 5-628, but is in no instance less than the host nation standard.

3-5. Condition inspection of railroad network

a. Inspections. Railroad track inspections will be conducted in accordance with TM 5-628 and the following guidance to identify defective conditions and determine the relative severity of those defects. The MACOMs will implement a track certification program under guidance given by the ACSIM.

b. Inspectors. A qualified track inspector that meets the qualifications listed in Appendix D will conduct track inspections.

3-6. Network level management

Network level management systematically develops strategies and priorities maintenance activities for installation track. This includes work identification, prioritizing, budgeting, and execution of M&R work.

3-7. Work planning

a. Minimum routine. M&R tasks for railroad track shall be incorporated into the installation resource management plan. Maps or plans of all railroad trackage will be maintained as part of the real property records.

b. AWP. The AWP for railroad track shall identify the ARR and the URR work planned for accomplishment in the program fiscal year and contain the following:

(1) The ARR Report portion of the AWP includes the following minimum routine railroad maintenance tasks shown in table 3-1, that should be accomplished annually for basic preventive and safety / functional maintenance measures. Each of the maintenance tasks listed in the table may not necessarily be accomplished annually at every installation or for every track segment nor is the list all inclusive. However, this list includes items of routine maintenance, which should be programmed to maintain acceptable and economical levels of performance. Inspections should be made annually on every track segment to identify all routine maintenance tasks. These tasks collectively should be identified as the ARR (AR 420-16) and be fully funded. IJOs which include specific task description and location, the unit of measure (track feet, miles, or meters) and unit cost, will be prepared to facilitate orderly planning, review, and analysis for each task.

(2) The major M&R portion of the AWP includes major M&R projects. Prioritization of major M&R alternatives should be based upon cost, type of repair and track condition.

c. Five-year long range plan. Long range plans will be developed for a 5 year period, year by year, and consist of the level of anticipated ARR work requirements and a network level M&R project list.

d. Snow removal and ice control plan. At installations where snow and ice accumulate on railroad track, a snow removal and ice control plan will be prepared. The plan should include all railroad track identified by priority for clearance, equipment and materials needed, and arrangement for military troop support and other emergency planning measures.

e. Conformance to master plan. Minor construction projects for railroad track will conform to the master plan for the installation in accordance with AR 210-20.

3-8. Project level management

Project level management consists of determining the most feasible M&R alternative for each track segment. This should be accomplished as defined below.

a. Detailed inspection. Results of railroad track inspections shall be used to determine maintenance, repair, and construction needs at the project level.

b. Problem definition. Deterioration of railroad track and appurtenances should be investigated to determine the cause of failure and to provide a basis for corrective action.

c. Identification of alternatives. M&R alternatives, which will eliminate or reduce the factors that led to the deterioration of the railroad track should be developed.

d. Project analysis. Documentation of project analysis shall be included in the project files for each track project over \$50,000. Documentation should consist of a record of data relevant to the project, including a life cycle cost analysis of each feasible alternative developed. Relevant data should include the following:

- (1) Project title/description.
- (2) Project location.
- (3) Facility/branch/section number (s).
- (4) Facility / branch use (s).
- (5) Category code (5-digit).
- (6) Facility/branch use (s).
- (7) Track category.
- (8) Track age (s).
- (9) Repair alternatives considered.
- (10) Life-cycle economic analysis for each alternative.

e. Preliminary design. Qualified engineering personnel will develop maintenance, repair, and improvement projects using the AWP as the source for work requirements.

3-9. Project approval

Projects will be approved in accordance with AR 420-10, AR 415-15, and MACOM policies.

3-10. Project plans and specifications

a. Design criteria. The DPW guidance for design criteria for the track is in TM 5-850-2.

b. Materials and specifications. Materials and specifications used in the performance of maintenance, repair and minor construction work will conform to the applicable Federal, Military, State, AREA, ASTM, AWWA, and other recognized national or host-nation industry and technical specifications and standards.

c. Engineering. A professional engineer, with railroad experience, shall be used for all railroad track designs.

3-11. Traffic engineering

a. Outloading studies should be performed periodically, since they can be an important planning document. Transportation Capability Studies are performed by MTMC-TEA. The DPW should contact MTMC-TEA to obtain copies of their latest study or to request that a study be performed.

b. Signs and signals governing vehicular and pedestrian traffic shall be installed and maintained in accordance with the requirement MUTCD or host nation.

3-12. Snow removal and ice control

The DPW is responsible for snow and ice control on railroads, including provision of off-track equipment, snow fences, switch heaters, and chemicals to comply with paragraph 2-16.

3-13. Safety

a. Flagmen and watchmen service.

(1) *Flagmen*. Where maintenance, repair, and construction of railroads is accomplished in areas where vehicle or pedestrian traffic is possible, flagmen will be posted.

(2) *Watchmen*. Grade crossing watchmen service required for normal rail movements is the responsibility of the railroad operator.

b. Work zone traffic control. For work in the vicinity of grade crossings, work zone traffic control will be in accordance with TM 5-627, TM 5-624, and MUTCD.

c. Grade crossing traffic control devices. Railroads are the responsibility of the DPW. Grade crossing traffic control devices will be in accordance with the MUTCD.

d. Switch targets and lamps. Each switch stand will be equipped with switch targets or lamps. Reflectorized targets will be used where operating conditions warrant. Illuminated lamps should be used only where there are frequent train movements at night. Do not use lamps where explosive or highly combustible materials are stored or handled. Sealed or enclosed electric lamps may be used in hazardous areas when approved from a safety standpoint.

3-14. Quality assurance

The inspection of maintenance, repair and construction work in progress, whether by in-house forces or A/E services will be on a timely basis with special attention to quality assurance. Quality assurance inspections will be made on railroad track and appurtenance work and will be commensurate with the work performed. Random monitoring may be used for work performed in-house or by an operating contractor. Continuous inspection should be provided for work performed by an outside contractor. Inspectors should demonstrate knowledge of proper railroad maintenance, repair, and construction procedures, and of sampling, testing, and field inspection work. Quality Assurance Representative's Guide, Volume 1, Chapter 2F, Railroads, EP 415-1-261 provides a useful quality assurance checklist. In addition, quality assurance inspectors should also be a certified track inspector, see paragraph 3-5.

3-15. Railroad track scales

Track scales will be checked periodically by standard tests as prescribed by the AREA.

3-16. Record keeping and project closeout

Closing a project out will consist of updating the database to reflect changes in the network inventory, track condition, real property records, and IFS-M.

3-17. Disposal

a. Railroad trackage, which is not required for current operations, will be placed in standby status in accordance with AR 210-17. Traffic on each track or major portion thereof will be reviewed annually, to determine if individual tracks are required. Tracks not needed will be taken out of service and placed on standby status. Concurrently, tracks, which have been in standby status for 1 year or more, will be reviewed. Action will be taken to dispose of tracks for which there is no foreseeable need in accordance with AR 405-90. Removal of railroad trackage from an installation rail network, abandonment of interchange tracks with serving carriers, potential abandonment or abandonment of the commercial track serving the installation, and significant changes affecting the transportation capability of the rail net will be staffed through Director of Transportation and Services DCSLOG, Washington, DC 20310, within 30 days of the submission of DA Form 337 (Request for Disposal of Buildings and Improvements). Category C track with no foreseeable mission should be reported to MACOM's and removed within 1 year, or procedures for removal should be identified by the MACOM within 1 year.

b. When railroad track is removed, a sufficient quantity of sound track material should be stockpiled for future use as replacement material.

Table 3-1
Routine Railroad Maintenance Tasks

GENERAL TRACK MAINTENANCE	INSPECTION	TRAFFIC CONTROL
Ditch and culvert cleaning	Track inspection	Maintain signs and signals
Vegetation control and brush cutting	Internal rail inspection	
Lubricate and check adjustment of switches	Crossing sign inspection	
Tighten and replace all track bolts	Grade crossing inspection of riding surface and traffic control devices	
Redrive loose or missing spikes	Track geometry inspection	
Grind or weld switch and frog		
Spot correction of track geometry		

Table 3-1
Routine Railroad Maintenance Tasks—Continued

GENERAL TRACK MAINTENANCE	INSPECTION	TRAFFIC CONTROL
Snow and ice control		

- (RM-1) Track inspection
- (RM-2) Inspect and clean drainage structures and channels
- (RM-3) Vegetation maintenance and control
- (RM-4) Redrive loose spikes or replace missing spikes
- (RM-5) Tighten or replace bolts
- (RM-6) Remove and reset rail anchors
- (RM-7) Tighten gage rods
- (RM-8) Clean flangeways and crib areas of turnouts
- (RM-9) Clean flangeways at road grade crossings
- (RM-10) Lubricate and adjust switches
- (RM-11) Maintain signs and signals
- (RM-12) Snow removal and ice control ("M account")
- (RM-13) Shimming/removal of shims
- (RM-14) Spot correction of track geometry (includes spot tamping)
- (RM-15) Inspect and test crossing signal devices
- Railroad Track Repair**
- (RR-1) Replace defective or missing ties
- (RR-2) Install tie plates
- (RR-3) Replace defective joint bars
- (RR-4) Remove or replace bent or broken gage rods
- (RR-5) Replace defective rail
- (RR-6) Turnout repair
- (RR-7) Repair rail crossings/crossing frogs
- (RR-8) Replace signs and signals
- (RR-9) Increase rail weight (only when required to support a validation mission.
- (RR-10) Re-position guard rail
- (RR-11) Increase ballast thickness/ballast section
- (RR-12) Clean and replace ballast
- (RR-13) Ballast and subgrade stabilization
- (RR-14) Repair highway grade crossing
- (RR-15) Surfacing and lining track
- Railroad Track Construction**
- (RC-1) Changing track alignment (exception, para 3-3d (3))
- (RC-2) Track extension or construction of track on new location
- (RC-3) Addition of grade crossing signs or signals where none existed before
- (RC-4) Replacement of entire facility (see para 3-3c for definition of "single real property facility")

This list is not all inclusive, but rather it contains types of work which are commonly performed in order to maintain, repair, and construct railroad track.

Figure 3-1. Work Designation Codes-Railroad Track Maintenance

Chapter 4 **Bridges**

Section I **Policies**

4-1. Introduction

a. The general policy is to manage bridges, major culverts, and retaining walls to accomplish the purpose of this regulation established in Chapter one, by periodically:

- (1) Inventorying, inspecting, and assessing condition of all structures.
- (2) Establishing and executing work plans to reach and maintain predetermined facility condition.
- (3) Performing preventive maintenance systematically. All preventive maintenance work will be included as an Annual Recurring Requirement (ARR) and should be fully funded.
- (4) Developing maintenance and repair strategies to protect investment in structures, make best use of available resources, and meet mission requirements.
- (5) The Army has a program agreement with FHWA for compliance with the National Bridge Inspection Standards.
 - b.* For reportable bridges, (see 'bridge' definition in the Glossary), within the 50 States, the Surface Transportation Assistance Act of 1978 (PL 95-599) requires that all structures defined as bridges on public roads be inventoried and inspected in accordance with the National Bridge Inspection Standards (NBIS). Under the standards, each installation is required to:
 - (1) Record and maintain structure inventory and appraisal data on each vehicular bridge that is open-to-the-public.
 - (2) Submit the data to the MACOM to forward to Headquarters Department of the Army, Assistant Chief of Staff for Installation Management, (ACSIM), Facilities Policy Division, ATTN: DAIM-FDF, 600 Army Pentagon, Washington, DC 20310-0600. ACSIM will forward to Federal Highway Administration (FHWA).
 - c.* A triennial on-site review of the installation's bridge maintenance program by the MACOM's engineer staff is required.

4-2. Work classification

a. General. M&R work and minor construction, for facilities other than family housing, are defined in AR 420-10. The Military Construction, Army (MCA) and Unspecified Minor MCA programs are defined in AR 415-15. For purposes of reviewing projects for determination of appropriate work classification, the above referenced regulations in conjunction with DA Pam 420-11 and the definitions that follow provide guidance for making work classifications. DA Pam 420-11, explains in detail the accepted interpretations of what is maintenance, repair, or minor construction projects and the classification of work. Bridges are a part of the roadway, pedestrian walkway, or rail track network. Therefore, the definitions of 'single real property facility', paragraph 2-3a(1) and 3-3c apply for the purpose of work classification.

b. Work classification categories.

(1) *Maintenance.* Maintenance work for structures consists of cyclic or preventive work, which will prolong the life of the structure. The types of work which are classified as maintenance are listed under the Work Designation Codes in figure 4-1.

(2) *Repair.* Replacement of a portion of a structure or the structure in its entirety is considered to be repair provided the structure is in a failed or failing condition and the new structure is in the same location as the initial structure, an adjacent location which improves the alignment of the adjoining roadway or track, or a location adjacent to the existing location in cases where access must be maintained during repairs and no feasible detour exists. Replacement does not have to be of the same material as the previous construction. If a bridge is replaced in its entirety, in the same location as the previous structure, any increase in load capacity (other than that related to a normal growth and evolution of mission, equipment, and facilities) or increase in surface area is normally considered to be upgrading or new construction. Lane width of vehicular bridges may be increased in conjunction with bridge replacement to meet current geometric standards (AASHTO bridge design manual). However, addition of new traffic lanes is properly classified as construction. Cost will be allocated to repair and construction classifications of work, taking into account structural consideration as well as increases in surface area. The types of work which are classified as repair are listed under the Work Designation Codes in figure 4-1.

(3) *Construction.* Replacement of a bridge, trestle, or major culvert or retaining wall in a new location is considered to be construction. The types of work, which are classified as construction, are listed under the work designation codes in figure 4-1.

Section II

Levels of Performance for Bridges

4-3. Introduction

Methods of maintaining, repairing, and improving bridges, major culverts, and retaining walls are described in TM 5-600.

4-4. Performance standards

a. All bridges, major culverts, retaining walls, and appurtenances shall be maintained in good or fair condition as defined in TM 5-600 and the Bridge Inspector's Training Manual/90.

b. The following bridge condition rating ranges, as defined in TM 5-600 and the Bridge Inspector's Training Manual/90, shall be used for the Installation Status Report (ISR) ratings:

- (1) Bridge Condition Rating 7-9 equals an ISR Green Rating.

- (2) Bridge Condition Rating 5-6 equals an ISR Amber Rating.
- (3) Bridge Condition Rating 0-4 equals an ISR Red Rating.
- c. The load capacity shall be sufficient for current and mobilization requirements. Vehicle bridges shall be closed if the capacity (live load) is less than 3 tons.
- d. Deck overlays are prohibited unless approved by a structural engineer. Copies of the approval are to be placed in a permanent bridge file.

Section III

Bridge Management Procedures

4-5. Bridge inventory

a. The Army has a Program Agreement with FHWA, Appendix E, for Compliance with the National Bridge Inspection Standards (NBIS). The NBIS and Program Agreement process requires the DPW to maintain a current inventory of all bridges and major culverts. The inventory shall identify for each bridge:

(1) Those bridges which contain fracture critical members, the location and description of such members on the bridge and the inspection frequency and procedures for inspection of such members. (Fracture critical members are tension members of a bridge whose failure will probably cause a portion of or the entire bridge to collapse.)

(2) Those bridges with underwater members, which cannot be visually evaluated during periods of low flow or examined by, feel for condition, integrity and safe load capacity due to excessive water depth or turbidity. These members shall be described, the inspection frequency stated, not to exceed five years, and the inspection procedure specified.

(3) Those bridges which contain unique or special features requiring additional attention during inspection to ensure the safety of such bridges and the inspection frequency and procedure for inspection of each such feature.

b. The DPW shall maintain a file for each bridge and major culvert on the inventory. As a minimum, the file will contain the following:

- (1) Inspection reports.
- (2) Structural and load rating analysis.
- (3) Maintenance / repair history and requirements (copies of DA Forms 4283, and DD Forms 1391).
- (4) Drawing number and location of as-built drawings.
- (5) SI&A data sheets, if the bridge is reportable (see bridge definition in Glossary).
- (6) Photographs.
- (7) Scour evaluations as outlined in FHWA Hydraulic Engineering Circular (HEC) 18, 'Evaluating Scour at Bridges,' and HEC 20, 'Stream Stability at Highway Structures.' Provide a copy of all level I, level II and higher if required, scour evaluations to ACSIM, Facilities Policy Division.

c. The inventory will be updated after each routine (biennial) inspection and as known changes occur.

d. Each reportable bridge will be separately identified.

e. Public Law 95-599 requires that federal reportable bridges be included in the FHWA's National Bridge Inventory. This shall be accomplished as follows:

(1) Annually, installation DPWs shall update the Structural Inventory & Appraisal (SI&A) data sheet (Figure 4-2) for all reportable bridges to their MACOM using the Bridge Inventory System (BIS). Guidance for completing the SI&A data sheet is contained in the FHWA's National Bridge Inventory (NBI) Recording and Coding Guide, which may be obtained by writing: Bridge Division, Federal Highways Administration, 400 7th Street, S.W., Washington, DC 20590.

(2) The MACOMs shall consolidate all installation BIS data into a MACOM BIS report and submit it prior to 1 January each year to ACSIM, Facilities Policy Division.

(3) The ACSIM shall be responsible to consolidate the MACOM BIS data and compile an Army report and submit it to FHWA, prior to 31 March of each calendar year.

4-6. Inspection

a. All bridges and major culverts on all Army installations will be inspected as identified in this regulation at regular intervals not to exceed 2 years. Technical guidance on inspections is contained in TM 5-600, FHWA's Manual for the Condition Evaluation of Bridges and the Bridge Inspector's Training Manual / 90.

b. Army installation reportable bridges shall be inspected and evaluated in compliance with the NBIS.

c. Bridge inspectors shall meet the minimum qualifications stated in Appendix D of this regulation.

d. *Types.* Inspections during the service life of the bridge include an initial, maintenance, routine, damage, in-depth, and special inspections. See Appendix B for a description of types.

e. *Frequency of inspections.* Frequency of each type of inspection is provided below. More frequent inspections may be required depending upon the age, present load capacity, traffic, type of construction, state of maintenance, and any known deficiencies related to fatigue, scour, fracture critical members, and corrosion. The maximum inspection interval

may be increased for bridges if past inspection reports and favorable experience and analysis justify. Prior approval for increasing the inspection interval of vehicle bridges open-to-the-public must be obtained from the FHWA (maximum of four years). For all other bridges, before a change is made in the inspection frequency, the engineer responsible for that request is to document the rationale, place it in the bridge file and forward a copy to the MACOM for review and concurrence (maximum of five years).

(1) *Inventory*. An inventory inspection is conducted after initial construction is complete and when there has been a change in the configuration of the structure (e.g., widening, lengthening, supplemental bents).

(2) *Maintenance*. A maintenance inspection will be conducted annually. Inspection of easily accessible underwater members should be included as part of maintenance inspections.

(3) *Routine*. A routine inspection shall be conducted biennially unless the condition of the bridge indicates that more frequent inspections are required. Inspection of easily accessible underwater members should be included as part of routine inspections.

(4) *Damage*. A damage inspection is an unscheduled inspection to assess structural damage resulting from environmental factors (e.g., flooding, severe weather) or human actions (e.g., vehicle impact).

(5) *In-Depth*. In-Depth inspections are conducted when appropriate or necessary to fully ascertain the existence of or the extent of any deficiency(ies). This type of inspection can be scheduled independently of a Routine Inspection, though generally at a longer interval, or it may be a follow-up for Damage or Initial. An In-Depth underwater inspection will be conducted on all underwater members at an interval not to exceed 5 years.

(6) *Special*. Special bridge inspections will be conducted at the discretion of the local engineer.

4-7. Emergency Bridge Closures

In the event the condition of a bridge requires emergency closing or restricting of traffic, the engineer responsible for the bridge will notify the MACOM and DAIM-FDF within 24 hours so that like structures in the Army inventory can be identified and inspected. The notification will include the bridge identification number, the event, bridge element that caused the emergency closure or restriction, and intended emergency remedial action.

4-8. Bridge Analysis and Posting

a. *Load Rating Vehicle Bridges*. The specifications and procedures prescribed in the AASHTO Manual for the Condition Evaluation of Bridges shall be used for determining the maximum safe live load capacity of existing bridges. Vehicle bridges, as a minimum shall be rated for the AASHTO system of loading (i.e., HS20, Type 3, Type 3S2, Type 3-3), except at OCONUS locations where host nation loading standards will be used and CONUS locations where host state requires additional or modified loading standards (e.g., Georgia Type 3).

b. *Military Load Class*. The specifications and procedures prescribed in the AASHTO Manual for the Condition Evaluation of Bridges shall be used for determining the maximum safe military load classification of existing bridges. Military live load data is contained in Appendix C of FM 5-446. The analysis procedure and criteria in FM 5-446 shall not be used to rate installation bridges.

c. *Load Rating Railway Bridges*. The Manual for Railway Engineering, volumes 1 and 2 shall be used for determining the maximum safe live load capacity of existing bridges. Railway bridges shall be rated for the Cooper E Series of loading and for the maximum train that the specific bridge must carry. For the purpose of reporting, these trains shall be converted to an equivalent Cooper loading. Additional technical guidance for railway bridges is contained in TM 5-850-2.

d. *Posting*. All bridges with military traffic shall be posted with the military load class number. Vehicle bridges and major culverts with a live load capacity less than that required for the AASHTO type vehicles (i.e., type 3, 3S2, 3-3; or host nation or state posting loads) shall also be posted showing the safe load limit for each vehicle. Regulatory signing should conform to the requirements of the AASHTO Manual on Uniform Traffic Control Devices (MUTCD). In addition, CONUS locations shall comply with host state required additional or modified posting standards. At OCONUS locations, postings shall comply with host nation standards. Installations may close a structure at any posting threshold, but bridges not capable of carrying a minimum gross live load weight of three tons must be closed.

4-9. Bridge maintenance management

Results of inspections will be used to determine maintenance, repair, or improvements needed for each structure.

4-10. Work planning

a. The installation RMP is a consolidation of all DPW developed plans into a single integrated plan that reflects all major requirements, initiatives, actions and objectives at least 5 years into the future. Minimum routine M&R tasks and major projects for structures shall be incorporated into the installation RPM as outlined in DA Pamphlet 420-6. Installation site road maps should be used as a visual aid to help depict and present the structures annual and long range work plans portion of the RMP.

b. Preparation and periodic updating of work plans for bridges, major culverts and retaining walls will comply with

the following guidance. All work identified as a result of comparing the inspection reports with the performance standards will be used for the ARR and identifying total requirements.

c. The AWP for structures shall identify the ARR and the major M&R projects planned for accomplishment in the program fiscal year and contain the following:

(1) The ARR portion of the AWP includes the minimum for routine bridge maintenance tasks, outlined in table 4-1, that should be accomplished at least once annually for basic preventive and safety / functional needs. Each of the maintenance tasks in table 4-1 may not necessarily be accomplished annually at every installation or for every bridge; nor is the list all inclusive. However, this list includes routine maintenance, which should be programmed annually, to maintain acceptable and economical levels of performance. These tasks collectively should be identified as the ARR (AR 420-16) and be fully funded. Separate IJOs which include specific task description and location, the unit of measure and unit cost, will be prepared to facilitate orderly planning, review, and analysis for each of the tasks listed on table 4-1.

(2) The major M&R portion of the AWP will identify work based on comparison of major M&R alternatives. Prioritization of major M&R projects should be based upon cost, type of repair, structure type and condition, local conditions, and realistic budget levels.

d. Long range plans will be developed for a 5 year period, year by year and consist of the level of anticipated ARR work requirements.

e. Minor construction projects for structures and appurtenances will conform to the Master Plan for the installation in accordance with AR 210-20.

4-11. Project level management

Project level management decisions should be based on a detailed analysis of the following:

a. *Bridge inspection.* Results of bridge inspections shall be used in conjunction with additional detailed inspections to determine maintenance, repair, and construction needs at the project level.

b. *Problem definition.* Deterioration of bridge elements should be investigated to determine the cause and to provide a basis for corrective action.

c. *Development and selection of alternatives.* M&R alternatives, which will eliminate or reduce the factors that led to the deterioration of the structure should be developed. Bridge maintenance and rehabilitation alternatives must be reviewed before replacement is considered as an alternative. Project selection should be based (M&R versus replacement) upon lowest life cycle costs that meet loading and other serviceability factors.

d. *Project analysis.* Documentation of project analysis shall be included in the project files for each bridge project over \$50,000. Documentation should consist of data relevant to the project, including:

- (1) Project number.
- (2) Project description.
- (3) Facility number / branch.
- (4) Project location.
- (5) Category code (5-digit).
- (6) Facility use(s).
- (7) Bridge type.
- (8) Adjacent pavement rank (s).
- (9) Bridge dimensions/area.
- (10) Bridge age (s).
- (11) Bridge condition.
- (12) Deck roughness.
- (13) Feasible M&R strategies.
- (14) Life cycle costs.

e. *Preliminary design.* Qualified engineering personnel will review maintenance, repair, and construction projects using the AWP as the source for work requirements.

4-12. Project validation

a. All M&R projects submitted to DAIM-FDF for DA approval will be thoroughly reviewed by the MACOM operating agency commanders to validate work classification and scope of work. Project documentation will include that prescribed in AR 420-10 and DD Form 1391. For a single undertaking involving more than one classification of work, costs applicable to each classification of work are to be considered separately with reference to limitations and approval authority.

b. For all bridge projects, a project folder should be maintained by the DPW and include a cost estimate with life cycle cost analysis; an analysis of alternatives; justification for specific alternative, and a completed DA Form 4283, rationale for classification of the project.

4-13. Project approval

Projects will be approved in accordance with AR 420-10, AR 415-15, and MACOM policies.

4-14. Project plans and specifications

a. Design criteria. Design of bridges and other structures will be based on current design and technical guidance found in AASHTO (for vehicular bridges) and American Railway Engineering Association (AREA) (for railroad bridges). For OCONUS installations, the bridge shall be designed in accordance with host nation standards and criteria. Required bridge railings, transitions, approach guardrail, and end treatments shall be added / upgraded to current standards whenever a major rehabilitation is undertaken. The standards used shall be equal to or greater than those of the state or host nation where the bridge is located.

b. Materials and specifications. Materials and specifications used for maintenance, repair, and minor construction will meet Federal, Military, State, AASHTO or AREA, ASTM, and other recognized national or host-nation industry and technical specifications and standards. Wood used for structural members, planking, railroad ties, piles, posts, and other items in contact with the ground, concrete, or water will be preservative treated in accordance with criteria from the American Wood Preservers Association (AWPA).

c. Engineering. The services of a qualified engineer experienced in structural design will be used to determine the technical requirements and the manner of accomplishment of bridge projects.

4-15. Snow removal and ice control

Snow removal and ice control on bridge decks will conform to guidance in paragraphs 2-10c and 2-16.

4-16. Safety

Work zone traffic control. Work on bridges involves hazards associated with use of heavy equipment and movement of traffic. Necessary safety measures will be taken on bridges as outlined in the MUTCD, TM 5-624, EM 385-1-1, and Occupational Safety and Health Administration (OSHA) safety standards. These measures will be taken during all inspections involving maintenance, repair, and construction operations by both in-house and contract forces.

4-17. Quality assurance

The inspection of maintenance, repair, and construction work in progress, whether by in-house forces, or A/E services will be on a timely basis with special attention to quality assurance. Random monitoring may be used for work performed in-house or by an operating contractor. Continuous inspection should be provided for work performed by an outside contractor. Inspectors should demonstrate knowledge of proper maintenance, repair and construction procedures.

4-18. Record keeping and project closeout

In addition to retaining the project folder items listed in paragraph 3-11.b, bridge inventory report, real property records and IFS-M database will be updated.

4-19. Coordination

Open lines of communications should be maintained between project planners, designers, and inspectors at the network and project levels to provide information regarding bridge performance. This information should be used in development of preliminary M&R strategies at the network level and to modify future designs at the project level.

4-20. Disposal

Action will be taken to dispose of bridges, major culverts, retaining walls and appurtenances for which there is no foreseeable need, in accordance with AR 405-9.

Table 4-1
Routine Bridge Maintenance Tasks

GENERAL BRIDGE MAINTENANCE	TIMBER BRIDGE MAINTENANCE	STEEL BRIDGE MAINTENANCE	STONE MASONRY ARCH BRIDGE MAINTENANCE	INSPECTION
Prevention of scouring and undermining	Fire protection	Removing rust/scale & spot painting	Repointing mortar joints	Initial
Clean expansion joints and bearing plates	Insect protection	Tighten bolts and rivets	Replacing damaged or dislocated stones	Maintenance
Cleaning scuppers	Tightening braces	Tightening cables		Routine
Crack and joint sealing	Preservative treatment			Damage

Table 4-1
Routine Bridge Maintenance Tasks—Continued

GENERAL BRIDGE MAINTENANCE	TIMBER BRIDGE MAINTENANCE	STEEL BRIDGE MAINTENANCE	STONE MASONRY ARCH BRIDGE MAINTENANCE	INSPECTION
Tightening handrails & guardrail				In-Depth
Patching deck				Special
Patch painting of steel members				
Cleaning and lubricating rockers, pins and rollers				
Removing channel debris				
Snow removal and ice control				

Table 4-2
Summary of Inventory & Reporting Requirement

Bridge Type	Inventory and Record Keeping	Reporting
Reportable Bridges	1) Inspection report. 2) Structural Analysis and Load Rating. 3) Special Feature Inspection Reports. 4) Maintenance/repair History and copies of work request (DA Form 4283 & DD Form 1391). 5) Identification and location of As-built drawing. 6) Photographs.	1) Emergency bridge closures. 2) Submit SI&A sheet annually to the MACOM
All Other Bridges	1) Inspection report. 2) Structural Analysis and Load Rating. 3) Special Feature Inspection Reports. 4) Maintenance/repair History and copies of work request (DA Form 4283 & DD Form 1391). 5) Identification and location of As-built drawing. 6) Photographs.	1) Emergency bridge closures. 2) Other (as determined by MACOMs and/or Installation.

Table 4-3
Summary of Inspection & Analysis Requirements

Bridge Type	Inspection Type and frequency	Inspection Reference and Guidelines	Performance Levels	Analysis References and Guidelines
Reportable Bridges	1) Initial: After construction or a change in the structure. (Ref: 2, 3,5) 2) Maintenance: Annually. (Ref: 1,3) 3) Routine: Biannually. See Note 1 below.(Ref: 2,3,4,5) 4) Damage: Unscheduled resulting from environmental factors or human action. (Ref: 3,6,7) 5) In-Depth: When appropriate or necessary to fully ascertain the existence or extent of any deficiency. In-Depth inspection of underwater structural members that cannot be inspected visually, or by wading, are required at least every five years. (Ref: 3,6,7) 6) Special: At the discretion of the bridge owner. (Ref: 3,6,7)	1) TM 5-600 2) Manual for the Condition Evaluation of Bridges. 3) Bridge Inspector's Training Manual 90. 4) Bridge Inspector's Manual for Movable Bridges. 5) Culvert Inspection Manual. 6) Inspection of Fracture Critical Bridge Members.	1) Overall bridge rating of 5 or above. (Ref: 1,2) 2) Load Rating that meets the installation current and mobilization mission.	1) manual for the Contition Evaluation of Bridges. (Ref: 2)

Table 4-3
Summary of Inspection & Analysis Requirements—Continued

Bridge Type	Inspection Type and frequency	Inspection Reference and Guidelines	Performance Levels	Analysis References and Guidelines
		7) Underwater Inspection of Bridges.		
All Other Bridges	1) Initial: After construction or a change in the structure. (Ref: 1, 2,3,5) 2) Maintenance: Annually. (Ref: 1,3) 3) Routine: Biannually. See Note 1 below.(Ref: 1,2,3,4,5) 4) Damage: Unscheduled resulting from environmental factors or human action. (Ref: 3,6,7) 5) In-Depth: When appropriate or necessary to fully ascertain the existence or extent of any deficiency. In-Depth inspection of underwater structural members that cannot be inspected visually, or by wading, are required at least every five years. (Ref: 3,6,7) 6) Special: At the discretion of the bridge owner. (Ref: 3,6,7) 7) Underwater Inspection of Bridges.	1) TM 5-600 2) Manual for the Condition Evaluation of Bridges. 3) Bridge Inspector's Training Manual 90. 4) Bridge Inspector's Manual for Movable Bridges. 5) Culvert Inspection Manual. 6) Inspection of Fracture Critical Bridge Members.	1) Overall bridge rating of 5 or above. (Ref: 1,3) 2) Load Rating that meets the installation current and mobilization mission.	1) manual for the Contition Evaluation of Bridges. 2) Manual for Railway Engineering Vols 1 and 2. 3) TM 5-600

Notes:

¹ May be extended to a maximum of 4 years with prior approval of FHWA.

² May be extended to 5 years with approval of MACOM.

General Bridge Maintenance

- (BM-1) Prevention of scouring and undermining
- (BM-2) Cleaning expansion joints and bearing plates
- (BM-3) Cleaning scuppers
- (BM-4) Crack and joint sealing
- (BM-5) Tightening handrails
- (BM-6) Patching deck
- (BM-7) Painting steel members
- (BM-8) Cleaning and lubricating rockers, pins, and rollers

Timber Bridge Maintenance

- (BM-9) Fire protection
- (BM-10) Insect protection
- (BM-10.1) Tightening braces

Steel Bridge Maintenance

- (BM-11) Removing rust
- (BM-12) Tightening bolts and rivets
- (BM-13) Tightening cables

Stone Masonry Arch Bridge Maintenance

- (BM-14) Repointing mortar joints

General Bridge Repair

- (BR-1) Repairing scouring and undermining
- (BR-2) Pier, footing, and abutment repair
- (BR-3) Deck replacement
- (BR-4) Replacement of other bridge elements as defined in TM 5-600
- (BR-5) Replacing damaged or dislocated stones

Bridge Construction

- (BC-1) Replacement of a bridge in a new location.(see exception, para 3-3b (3))
- (BC-2) Lane addition

This list is not all inclusive, but rather it contains types of work which are commonly performed in order to maintain, repair, and construct bridges.

Figure 4-1. Work Designation Codes-Bridges

IDENTIFICATION

- (1) STATE NAME and CODE
- (211) MACOM
- (212) INSTALLATION NAME
- (202) COE/DA BRIDGE NUMBER
- (8) STRUCTURE NUMBER
- (5) INVENTORY ROUTE (ON/UNDER)
- (2) HIGHWAY AGENCY DISTRICT
- (3) COUNTY CODE
- (4) PLACE CODE
- (6) FEATURES INTERSECTED
- (7) FACILITY CARRIED
- (9) LOCATION
- (11) MILEPOINT/ KILOMETERPOINT
- (12) BASE HIGHWAY NETWORK and CODE
- (13) LRS INVENTORY ROUTE & SUBROUTE
- (16) LATITUDE DEG MIN SEC
- (17) LONGITUDE DEG MIN SEC
- (98) BORDER BRIDGE STATE CODE and SHARE_%
- (99) BORDER BRIDGE STRUCTURE NO.

STRUCTURE TYPE AND MATERIAL

- (43) STRUCTURE TYPE MAIN: MATERIAL
TYPE and CODE
- (44) STRUCTURE TYPE APPR: MATERIAL
TYPE and CODE
- (45) NUMBER OF SPANS IN MAIN UNIT
- (46) NUMBER OF APPROACH SPANS
- (107) DECK STRUCTURE TYPE and CODE
- (108) WEARING SURFACE/PROTECTIVE SYSTEM:
 - A) TYPE OF WEARING SURFACE and CODE
 - B) TYPE OF MEMBRANE and CODE
 - C) TYPE OF DECK PROTECTION and CODE

AGE AND SERVICE

- (27) YEAR BUILT
- (106) YEAR RECONSTRUCTED
- (42) TYPE OF SERVICE: ON
UNDER and CODE
- (28) LANES: ON STRUCTURE and UNDER STRUCTURE
- (29) AVERAGE DAILY TRAFFIC
- (30) YEAR OF ADT
- (109) TRUCK ADT %
- (19) BYPASS, DETOUR LENGTH (KM)

GEOMETRIC DATA

- (48) LENGTH OF MAXIMUM SPAN (M)
- (49) STRUCTURE LENGTH (M)
- (50) CURB ON SIDEWALK: LEFT (M) and RIGHT (M)
- (51) BRIDGE ROADWAY WIDTH CURB TO CURB (M)
- (52) DECK WIDTH OUT TO OUT (M)
- (32) APPROACH ROADWAY WIDTH (W/SHOULDERS) (M)

Figure 4-2. National Bridge Inventory-Structure Inventory and Appraisal Coding Sheet

-
- (33) BRIDGE MEDIAN and CODE
 - (34) SKEW in DEG
 - (35) STRUCTURE FLARED
 - (10) INVENTORY ROUTE MIN VERT CLEAR (M)
 - (47) INVENTORY ROUTE TOTAL HORIZ CLEAR (M)
 - (53) MIN VERT CLEAR OVER BRIDGE RDWAY (M)
 - (54) MIN VERT UNDERCLEAR REF (M)
 - (55) MIN LAT UNDERCLEAR RT and REF (M)
 - (56) MIN LAT UNDERCLEAR LT (M)

NAVIGATION DATA

- (38) NAVIGATION CONTROL and CODE
- (111) PIER PROTECTION and CODE
- (39) NAVIGATION VERTICAL CLEARANCE (M)
- (116) VERT-LIFT BRIDGE NAV MIN VERT CLEARANCE (M)
- (40) NAVIGATION HORIZ CLEAR (M)
- SUFFICIENCY RATING and STATUS

CLASSIFICATION CODE

- (112) NBIS BRIDGE LENGTH
- (104) HIGHWAY SYSTEM
- (26) FUNCTIONAL CLASS
- (100) DEFENSE HIGHWAY
- (101) PARALLEL STRUCTURE
- (102) DIRECTION OF TRAFFIC
- (105) FEDERAL LANDS HIGHWAYS
- (103) TEMPORARY STRUCTURE
- (110) DESIGNATED NAT'L NETWORK
- (20) TOLL -
- (21) MAINTAIN-
- (22) OWNER -
- (37) HISTORICAL SIGNIFICANCE

CONDITION CODE

- (58) DECK
- (59) SUPERSTRUCTURE
- (60) SUBSTRUCTURE
- (61) CHANNEL & CHANNEL PROTECTION
- (62) CULVERTS

LOAD RATING AND POSTING CODE

- (31) DESIGN LOAD or
- (63) OPERATING RATING METHOD
- (64) OPERATING RATING
- (65) INVENTORY RATING METHOD
- (66) INVENTORY RATING
- (70) BRIDGE POSTING
- (41) STRUCTURE OPEN, POSTED OR CLOSED, DESCRIPTION

APPRAISAL CODE

- (67) STRUCTURAL EVALUATION
- (68) DECK GEOMETRY
- (69) UNDERCLEARANCES, VERTICAL AND HORIZONTAL
- (71) WATER ADEQUACY
- (72) APPROACH ROADWAY ALIGNMENT
- (36) TRAFFIC SAFETY FEATURES

Figure 4-2. National Bridge Inventory-Structure Inventory and Appraisal Coding Sheet—Continued

(113) SCOUR CRITICAL BRIDGES

PROPOSED IMPROVEMENTS

(75) TYPE OF WORK CODE
(76) LENGTH OF STRUCTURE IMPROVEMENT (M)
(94) BRIDGE IMPROVEMENT COST (\$K)
(95) ROADWAY IMPROVEMENT COST (\$K)
(96) TOTAL PROJECT COST (\$K)
(97) YEAR OF IMPROVEMENT COST ESTIMATE
(114) FUTURE ADT
(115) YEAR OF FUTURE ADT

INSPECTIONS

(90) INSPECTION DATE (M/Y)
(91) FREQUENCY (M)
(92) CRITICAL FEATURE INSPECTION:
(93) CFI DATE (M/Y)
 A) FRACTURE CRIT DETAIL
 B) UNDERWATER INSP
 C) OTHER SPECIAL INSP
(213) MILITARY WHEEL LOAD CLASS
(214) MILITARY TRACK LOAD CLASS
(215) INSTALLATION NUMBER

MODIFIED SI&A FOR OCONUS INSTALLATIONS

(202) BRIDGE NUMBER: (15 Digits)
(211) MACOM NAME: (20 Digits)
(212) INSTALLATION NAME: (20 Digits)
(213) MILITARY LOAD CLASS, WHEELED: TONS (4 Digits)
(214) MILITARY LOAD CLASS, TRACKED: TONS (4 Digits)
(6) FEATURES INTERSECTED: (25 Digits)
(7) FACILITY CARRIED BY STRUCTURE: (18 Digits)
(21) MAINTENANCE RESPONSIBILITY: (2 Digits)
(27) YEAR BUILT: (4 Digits)
(49) STRUCTURE LENGTH: METERS (6 Digits)
(58) DECK (1 Digit)
(59) SUPERSTRUCTURE (1 Digit)
(60) SUBSTRUCTURE (1 Digit)
(61) CHANNEL & CHANNEL PROTECTION (1 Digit)
(62) CULVERTS (1 Digit)
(90) INSPECTION DATE: (M/Y, 4 Digits)

Figure 4-2. National Bridge Inventory-Structure Inventory and Appraisal Coding Sheet—Continued

(219) ISR GENERAL BRIDGE CONDITION (1 Digit)

EXPLANATION OF ITEMS

(202) Bridge Number: 15 digits total length

Cols 1 – 2	=	DA	2 Characters, <u>always DA</u>
Col 3	=	W (orld Wide)	1 Character, <u>always W</u>
Cols 4, 5 & 6	=	MACOM	3 Characters
		Example: EUR	(See enclosed list)
Cols 7, 8 & 9	=	Installation	3 Characters
		Example: FRA	(See enclosed list)
Col 10	=	P/N/R/X/W	1 Character
		(P)ublic Access	
		(N)on Public Access	
		(R)ailroad	
		(X) Pedestrian Public Access	
		(W) Pedestrian Non-Public Access	
Cols 11 – 15	=	Assigned by Installation	5 Characters
			<u>Or IFSM facility</u>

code

Example: Item 202 for a Public Access Bridge in the U.S. Army Europe, Frankfurt

Col:	1 2	3	4 5 6	7 8 9	10	11 - 15
Input:	D A	W	E U R	F R A	P	00001

See Glossary terms “Closed to the public” and “Open to the public”

(211) MACOM Name: 20 digits maximum length.

(211) Installation Name: 20 digits maximum length.

(213) Military Load Class, Wheeled: 4 digits maximum length. This is defined in FM5-446 “Military Nonstandard Fixed Bridging”, TM5-312 “Military Fixed Bridges” and the Standard NATO Agreement (STANAG) for bridge posting.

(214) Military Load Class, Tracked: 4 digits maximum length. This is defined in FM5-446 “Military Nonstandard Fixed Bridging”, TM5-312 “Military Fixed Bridges” and the Standard NATO Agreement (STANAG) for bridge posting.

(6) Features Intersected: 25 digits maximum length. Describes which body of water or any other feature, is intersected by the bridge.

Figure 4-2. National Bridge Inventory-Structure Inventory and Appraisal Coding Sheet—Continued

(7) Facility Carried By Structure: 18 digits maximum length. Describes the road or track carried by the bridge.

(21) Maintenance Responsibility: 2 digits length. The options are:

27	Railroad
71	Military (DA)
72	Host Nation
80	Unknown

(27) Year Built: 4 digits. If the year built is unknown, provide a best estimate.

(49) Structure Length (Meters): 6 digits including one decimal point (XXXXX.X m)

(58) Deck: 1 digit. Numeric rating as stated by the Recording and Coding Guide for Structure Inventory and Appraisal of the Nation's Bridges, FHWA-PD-96-001.

(59) Superstructure: 1 digit. Numeric rating as stated by the Recording and Coding Guide for Structure Inventory and Appraisal of the Nation's Bridges, FHWA-PD-96-001.

(60) Substructure: 1 digit. Numeric rating as stated by the Recording and Coding Guide for Structure Inventory and Appraisal of the Nation's Bridges, FHWA-PD-96-001.

(61) Channel & Channel Protection: 1 digit. Numeric rating as stated by the Recording and Coding Guide for Structure Inventory and Appraisal of the Nation's Bridges, FHWA-PD-96-001.

(62) Culverts: 1 digit. Numeric rating as stated by the Recording and Coding Guide for Structure Inventory and Appraisal of the Nation's Bridges, FHWA-PD-96-001.

(90) Inspection Date: 4 digits. Record the month and year of the last routine inspection was performed. The number of the month should be coded in the first 2 digits with a leading zero as required and the last 2 digits of the year coded as the third and fourth digits of the field.

(219) ISR General Bridge Condition: 1 digit. The options are:

G	green
A	amber
R	red
N	Non Applicable

Figure 4-2. National Bridge Inventory-Structure Inventory and Appraisal Coding Sheet—Continued

Green Condition

- Bridge has sufficient two-way load capacity, height, and width for mission required vehicles.
- Bridge deck, superstructure substructure, channel and approach roadway are in good condition (inspection rating of 7, 8, 9, or N).
- Routine and special (if required) inspections are conducted within the required frequency and records are maintained.
- Bridge traffic safety features are rated 1 or N (if applicable).
- MCL is posted.
- Separated pedestrian walk-way, where required.
- Underpass marked for height and width restrictions.
- Accommodates special transport requirements

Amber Condition

- Bridge has sufficient one-way load capacity, height, and width for mission required vehicles.
- Bridge deck, superstructure substructure, channel and approach roadway are in fair condition (inspection rating of 5, 6).
- At least one routine and special (if required) inspection has been completed and recorded and an inspection is scheduled within one year.
- Bridge traffic safety features are rated 0 and are scheduled for upgrading.
- Bridge roadway used for pedestrians.
- Bridge and underpass marked for weight, height and width restrictions.
- Unable to accommodate special transport requirements, alternate route available.

Red Condition

- Bridge one-way load capacity height, and width are insufficient for mission required vehicles.
- Bridge deck, superstructure substructure, channel and approach roadway are in poor or critical condition (inspection rating of 0, 1, 2, 3, or 4).
- No routine or special (if required) inspections have been conducted; no records are available.
- Bridge traffic safety features (if applicable) rated 0 and no action is planned or rating is unknown.
- No bridge and underpass markings.
- Unable to accommodate special transport requirements and no alternate route.

Figure 4-2. National Bridge Inventory-Structure Inventory and Appraisal Coding Sheet—Continued

Chapter 5 Dams

Section I Policies and Procedures

5-1. Introduction

a. This chapter implements Public Law 92-367, as amended by Public Law 104-303, National Dam Safety Program Act, for Army installation dams.

b. The general policy is to manage Army installation dams, to accomplish the purpose of this regulation established in Chapter one, by periodically assessing condition of all dams, establishing work plans, and developing maintenance strategies to make best use of available maintenance funds. The life and health safety of downstream populations is a key consideration in the maintenance of dams.

5-2. Dam Policies

a. The proponent for Army installation dam policy is ACSIM, Facilities Policy Division. The Corps of Engineers Dam Safety Officer shall provide the ACSIM Facility Policy Division with dam safety technical support.

b. Army policy requirements for dams follow the Federal Guidelines for Dam Safety as established by the Federal Emergency Management Agency (FEMA). The following FEMA documents are to be on hand and utilized in managing installation dams, (documents may be obtained by writing Earthquakes & Natural Hazards Programs, 500 C Street, SW, Room 502, Washington, DC 20472):

- (1) FEMA 64, Emergency Action Planning Guidelines for Dams.
- (2) FEMA 65, Federal Guidelines for Earthquake Analyses and Design of Dams.
- (3) FEMA 93, Federal Guidelines for Dam Safety.
- (4) FEMA 145, Dam Safety: An Owner's Guidance Manual.
- (5) FEMA 148, Glossary of Terms for Dam Safety.

c. Preventive maintenance will be systematically applied to protect the investment in dams and to protect life and property downstream. Preventive maintenance of dams should provide a means for early detection of any deterioration of the structure. All preventive maintenance work will be included as an ARR and should be fully funded.

d. Concerted and continuing efforts will be directed toward accurate and complete identification, validation, programming, budgeting, and execution of all M&R requirements.

e. A triennial on-site review of the installation's dam maintenance program by the MACOM's engineer staff is required.

5-3. Hazard Potential Classification.

a. General. This regulation classifies Army dams according to their size and hazard potential. The Installation commander will have final authority on the classification and reclassification. Classifications of installation dams shall be reviewed and validated every two years by the installation Commander, in conjunction with submission of required information, (see paragraph 5-19), for the biennial National Dam Safety Program Progress Report, which is submitted to ACSIM.

b. Size Classification. The height and the storage capacity, both will be considered and the element producing the largest size category shall govern. Dams are classified by size as shown in Table 5.1. If the dam is located across a watercourse or a river, the height of the dam should be measured from the natural bed of the river at the downstream end of the dam to the maximum water storage elevation. However, if the dam is not across a watercourse or river then the height is measured from the lowest elevation at the toe of the dam to the maximum water storage elevation. In order to determine the storage capacity of a dam, the maximum storage elevation may be considered equal to that of the crest of the dam. Once the height and the storage capacity are established then size classification (i.e. small, intermediate or large) can be made as indicated in Table 5.1.

c. Hazard Potential Classification. The hazard potential classification, as accepted by the Interagency Committee on Dam Safety, is based on potential hazard pertaining to the possible loss of human life or property damage in downstream areas of the dam in the event that the dam or its appurtenant facilities fail. The hazard classification for dams is presented in Table 5.2. and as follows:

(1) *Low hazard potential.* Dams assigned the low hazard potential classification are those where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

(2) *Significant hazard potential.* Dams assigned the significant hazard potential classification are those dams where failure or mis-operation results in no probable loss of human life but can cause economic loss, environment damage,

disruption of lifeline facilities, or impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

(3) *High hazard potential.* Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

5-4. Work Classification

a. General.

(1) M&R work and minor construction are defined in AR 420-10. Unspecified Minor MCA (UMMCA) and Military Construction Army (MCA) programs are described in AR 415-15.

(2) DA Pamphlet 420-11. Provides guidance for determining work classification is found in the above regulations in conjunction with examples of maintenance, repair, and a minor construction projects and proper work classification.

b. Work classification categories.

(1) *Maintenance.* Maintenance consists of cyclic or preventive work to prolong the life of the dam. It includes those actions required to prevent dam deterioration or to correct minor defects. The types of work, which are classified as maintenance, are listed in the work designation codes in figure 5-1.

(2) *Repair.* Repair includes those actions necessary to restore the dam elements to a safe and efficient operating condition consistent with the purpose of the structure. Replacement of a portion of a dam is repair provided the structure is in a failed or failing condition. The types of work which are classified as repair are listed under the Work Designation Codes in figure 5-1.

(3) *Construction.* Construction / alteration includes actions involved in changing dam alignment, or increasing the hydraulic storage capacity. Replacement of a dam in a new location is considered to be construction. The types of work, which are classified as construction, are listed under the work designation codes in figure 5-1.

Section II

Levels of Performance for Dams

5-5. Introduction

Army dams at all CONUS installations will be maintained at or above the minimum condition levels of host State and as specified herein and in the above referenced FEMA documents. This assures that dams can support Army missions, protect life and property downstream, and protect current and future rehabilitation investments. Dam inspection, routine maintenance and repair programs for OCONUS sites may be done in conformance with FEMA requirements, but no instance less than the host nation standards.

5-6. Performance standards

a. All dams must be maintained to allow passage of the design flows (flood) without major deterioration of dam components or damaging erosive or undermining action, nor loss of stability. The selection of the design flood should be based on an evaluation of the relative risks and consequences of flooding, under both present and future conditions. When flooding could cause significant hazards to life or major property damage, the flood selected for design should have virtually no chance of being exceeded. If lesser hazards are involved, a smaller flood may be selected for design. However, all dams should be designed to withstand a relatively large flood without failure even when there is apparently no downstream hazard involved under present conditions of development.

b. Final decision responsibility on the design flood / risk analysis shall be the decision of the dam owner, the installation commander.

c. General criteria for maintenance requirements are found in FEMA document 145.

Section III

Dam Management Procedures

5-7. Introduction

Methods of inspecting, maintaining, repairing, and improving installation dams are described in FEMA document 145.

5-8. Inventory

a. The ACSIM, Facilities Policy Division shall maintain the official Army installation dam inventory. Updates and request for changes in classifications of dams must be submitted through supporting MACOM to ACSIM, Facilities Policy Division.

b. A dam is any artificial barrier, including appurtenant works, which impounds or diverts water, and which is either:

(1) Twenty-five feet or more in height from the natural bed of the stream or watercourse measured at the

downstream toe of the barrier or from the lowest elevation of the outside limit of the barrier if it is not across a stream channel or watercourse, to the maximum water storage elevation.

(2) Has an impounding capacity at maximum water storage elevation of fifty acre-feet or more.

c. However, all dams regardless of size or capacity will be identified and recorded on real property inventory records and properly maintained.

5-9. Inspection

a. *Inspections.*

(1) Formal (Periodic Technical) Inspection, at least every 5 years.

(2) Intermediate (Periodic Maintenance) Inspection, Annually.

(3) Special Inspections, as required and immediately after the dam has passed unusually large floods and after the occurrence of significant earthquakes, sabotage, or other unusual events reported by operating personnel.

b. *Qualifications of inspector.* Dam inspectors shall meet the minimum qualifications stated in Appendix D of this regulation.

c. *Inspection Forms.* Inspection forms contained in FEMA document 145 shall be utilized to conduct and record maintenance inspection. At the discretion of the installation, formal technical inspection results may be recorded utilizing the standard format of the supporting Corps of Engineer district.

5-10. Work Planning

a. The installation Resources Management Plan (RMP) is a consolidation of all DPW developed plans into a single integrated plan that reflects all major requirements, initiatives, actions and objectives at least 5 years into the future. Routine dam M&R and inspection shall be incorporated into the installation RMP.

b. *Annual Work Plan, (AWP).* The AWP for dams shall identify the ARR and major M&R planned for accomplishment in the program fiscal year and contains the following:

(1) The ARR includes the routine dam maintenance tasks shown in table 5-1. These tasks should be accomplished on an annual basis to preserve the integrity of the dam structure, prevent more costly M&R treatments, and to assure down stream safety. Tasks identified within the ARR should be fully funded on an annual basis. Separate Individual Job Orders (IJO's) which include specific task description and location, the unit of measure and unit cost, will be prepared to facilitate orderly planning, review, and analysis.

(2) The major M&R portion of the AWP will be developed based on comparison of major M&R alternatives. Prioritization of major M&R projects should be based upon cost, type of repair, dam condition, and realistic budget levels.

c. *Five-year long-range plan.* The installation DPW shall develop and update long-range plans for a five year period by year and consist of the level of anticipated ARR work requirements and an overall M&R project list.

d. *Snow removal and ice control plan/procedure.* At installations where snow and ice accumulate, a snow removal and ice control plan/procedure will be prepared. The plan/procedure should include priority for clearance, equipment and materials needs such as snow fences, chemicals, and abrasives.

e. *Conformance to master plan.* Minor construction projects for dams and appurtenances will conform to the Master Plan for the installation in accordance with AR 210-20.

5-11. Project level management

Project level management encompasses detailed engineering management associated with the M&R of dams. Management decisions should be based on:

a. *Dam inspections.* Dam inspections are to be performed IAW paragraph 5-9.

b. *Development and selection of alternatives.* Dam M&R alternatives should be developed and analyzed. Project selection by installation DPW should be based on the lowest life cycle costs and overall safety factors.

c. *Project analysis.* Documentation of project analysis shall be included in the project files for each dam project over \$50,000. Documentation should consist of a record of data relevant to the project, including a life cycle cost analysis and safety consideration of each feasible alternative developed. Relevant data should include the following:

- (1) Project title/description.
- (2) Project location.
- (3) Facility number.
- (4) Category code (5-digit).
- (5) Facility use(s).
- (6) Age of Dam.
- (7) Type and quantity of dam distress.
- (8) Repair alternatives considered.
- (9) Life-cycle economic analysis for each alternative.

d. Preliminary design. A qualified engineer with dam experience will develop maintenance, repair, and construction projects using the AWP as the source for work requirements.

5-12. Project validation

a. All M&R projects submitted to ACSIM, Facilities Policy Division for approval will be thoroughly reviewed by the MACOM or operating agency commanders to validate work classification and scope of work. Project documentation will include that prescribed in AR 420-10 and DD Form 1391. For a single undertaking involving more than one classification of work, costs applicable to each classification of work are to be considered separately with reference to limitations and approval authority.

b. For all dam projects, a project folder should be maintained by the DPW and include a cost estimate with life cycle cost analysis, an analysis of alternatives, justification for project selection, a completed DA Form 4283, and rationale for classification of the project.

5-13. Project approval

Projects will be approved in accordance with AR 420-10, AR 415-15, and MACOM policies.

5-14. Project plans and specifications

a. Design criteria. The DPW will use current FEMA design criteria and guide specifications for the design of M&R projects involving dams, unless otherwise stated in this regulation.

b. Materials and specifications. Materials and specifications used in the performance of maintenance, repair and minor construction work will conform to the applicable federal, military, state, American Society for Testing and Materials (ASTM), and other recognized national or host nation industry and technical society specifications and standards. Materials will be inspected, tested, or certified to the degree necessary to ensure compliance with authorized specifications and standards.

c. Quality control.

(1) The DPW shall be responsible for a quality assurance (QA) check of all plans and specifications.

(2) All M&R projects exceeding \$100,000 shall contain Contractor quality control plans that address materials specification and use, specifically stating required testing and certification. The Contractor's quality control plan should provide for Contractor inspection and certification that materials incorporated in the works meet specifications.

5-15. Emergency Action Plans and Safety

a. An Emergency Action Plan (EAP) shall be prepared for each high and significant hazard installation dam. The plan will be prepared in accordance with FEMA documents 64, 93, and 145.

b. Low hazard dams should have a locally developed EAP Standard Operating Procedure (SOP) developed.

c. Signs and devices. Planning, design, and erection of safety signs, warning signals, and other safety devices should be based upon engineering analysis/studies and are the responsibility of the DPW. All safety related work shall be coordinated with the installation safety office.

d. Work area safety. Necessary safety measures will be taken to safely control and provide for other possible activities (e.g., boating, fishing, and hunting) while performing dam inspections and M&R work.

5-16. Quality assurance

The inspection of maintenance, repair and construction work in progress, whether by in-house forces, or architect/engineer (A/E) services will be on a timely basis with special attention to quality assurance. Quality assurance inspections will be made on all dam work and will be commensurate with the work performed. Random monitoring may be used for work performed in-house or by an operating contractor. Continuous inspection should be provided for work performed by an outside contractor. Inspectors should demonstrate knowledge of proper maintenance, repair and construction procedures.

5-17. Record keeping and project closeout

a. In addition to retaining the project folder items listed in paragraph 5-11, the following steps will be followed when closing a project upon completion of work and maintaining a permanent record for every project.

b. Real property records and IFS-M database will be updated.

c. A final project warranty inspection will be conducted before the warranty on the work expires. A record of this inspection will be retained in the project folder.

5-18. Coordination

Open lines of communications should be maintained between all concerned parties (e.g., project planners, designers, inspectors, installation safety officer, recreation officer, and the training officer) for all planned dam M&R projects. Information obtained by this coordination should be used in development of M&R strategies and to modify future designs and schedule actual work. Installation DPW operations and maintenance personnel shall participate in dam

safety training and awareness programs. Installations with high and significant hazard dams shall also coordinate with downstream communities.

5-19. Reporting

- a. The DPW shall maintain a current inventory of all installation dams.
- b. A file for each dam on the inventory will be maintained. As a minimum, the file will contain the following:
 - (1) Inspection reports.
 - (2) Design / structural analysis.
 - (3) Maintenance / repair history and requirements (copies of DA Forms 4283, and DD Forms 1391).
 - (4) Drawing number and location of as-built drawings.
 - (5) Photographs.
- c. The installation inventory will be updated after each informal (maintenance), formal (technical) and special inspection and as known changes occur.
- d. The National Dam Safety Program Act requires that the status of federal dams be reported biennially to Congress. The biennial report for the Army is submitted to Federal Emergency Management Agency (FEMA) at the end of odd numbered fiscal years. This shall be accomplished as follows:
 - (1) Installation DPWs, shall biennially update their portion of the Army dam inventory current as of 1 October, in a format following the National Inventory of Dams Methodology, and provide required information to their MACOMs. Installation personnel shall participate in dam safety training for operations and maintenance Installations with high and significant hazard dams shall coordinate with downstream communities.
 - (2) MACOMs, shall consolidate installation reports and submit to Army Assistant Chief of Staff Installation Management, Facility Policy Division by five January on each odd number year.
 - (3) The ACSIM Facilities Policy Division will be responsible for, consolidating the MACOM dam inventory data into an Army Dam Report, in a format for Federal Agencies, and submitting to FEMA.

5-20. Disposal

Action will be taken to dispose of dams and appurtenances for which there is no foreseeable need in accordance with AR 405-90.

Table 5-1
Size Classification

CATEGORY	IMPOUNDMENT	
	Storage(Ac)	Height(ft)
Small Dam	50 to less than 1,000	Less than 40
Intermediate Dam	1,000 to 50,000	40 to 50
Large Dam	More than 50,000	More than 50

Table 5-2
Hazard Potential Classification

Hazard Potential Classification	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None expected	Low and generally limited to owner (County or Township roads, agriculture, support buildings)
Significant	None expected	Appreciable (Isolated homes, secondary roads, minor railroads lines, public utilities)
High	Probable	Yes, (but not necessary for this classification) (major highways, railroads public utilities, homes, major agriculture, commercial or industrial facilities)

General Dam Maintenance

- (DM-1) Cleaning spillway
- (DM-2) Testing control features
- (DM-3) Lubricate and adjust control devices
- (DM-4) Dam inspections (technical, annual maintenance, and special such as after major storms/flooding or disturbance)
- (DM-5) Monitor watershed changes
- (DM-6) Maintenance of retaining walls
- (DM-7) Vegetation control and brush cutting
- (DM-8) Erosion control
- (DM-9) Rodent damage control
- (DM-10) Livestock damage control
- (DM-11) Cleaning downstream channel
- (DM-12) Cleaning shoreline
- (DM-13) Cleaning stilling basin
- (DM-14) Cleaning inlet/outlet structure

General Dam Repair

- (DR-1) Repair/replacement of mechanical / electrical systems
- (DR-2) Repair/replacement of control features (e.g., gates, valves)
- (DR-3) Repair/replacement of deteriorated concrete

General Construction

- (DC-1) Replacement of a dam in a new location
- (DC-2) Raising the crest of a dam
- (DC-3) Installation of additional appurtenances
- (DC-4) Installation of an emergency warning system
- (DC-5) Installation of a riprap system

This list is not all inclusive, but rather it contains types of work which are commonly performed in order to maintain, repair and construct dams.

Figure 5-1. Work Designation Codes-Dams

Appendix A References

Section I Required Publications

AR 55-80

Highways for National Defense. (Cited in para 2-15.)

AR 95-2

Air Traffic Control, Airspace, Airfields, Flight Activities, and Navigational Aids. (Cited 2-7.)

AR 190-5

Motor Vehicle Traffic Supervision. (Cited in para 2-15.)

AR 210-17

Inactivation of Installation. (Cited in paras 4-17.)

AR 210-20

Master Planning for Army Installations. (Cited in paras 2-10, 3-9 and 4-7)

AR 405-45

Inventory of Army Real Property. (Cited in paras 1-4, 2-3, and 4-1.)

AR 405-90

Disposal of Real Estate. (Cited in paras 2-21, 3-19, and 4-17.)

AR 415-15

Military Construction Program Development and Execution. (Cited in paras 2-3, 3-3, and 4-3.)

AR 415-28

Department of the Army Facility Classes and Construction Categories (Category Codes). (Cited in paras 2-3, and 4-3.)

AR 420-10

Management of Installation Directorates of Engineering and Housing. (Cited in paras 1-4, 2-3, 2-12, 2-13, 3-3, 3-12, 4-3, and 4-9.)

AR 420-16

Facilities Engineering Reports. (Cited in paras 3-9, and 4-7.)

AASHTO Manual for Maintenance Inspections of Bridges. (This publication can be acquired by writing to: AASHTO, General Offices, 444 N. Capitol Street NW., Suite 225, Washington DC 20001.) (Cited in para 3-7.)

DA Pam420-11

Project Definition and Work Classification.

DODI 6055.4

Traffic Safety

EP 415-1-261

Quality Assurance Representative's Guide, Volume 1. (Cited in para 3-14.)

FM 5-446

Military Nonstandard Fixed Bridging Public Law Title 23 U.S.C. 151 Highways

TM 5-600

Bridge Inspection, Maintenance, and Repair.

FM 5-628

Railroad Track Standards

TM 5-623

Pavement Maintenance Management. (Cited in paras 2-2, 2-3, 2-4, 2-6, 2-8, and 2-10.)

TM 5-624

Maintenance and Repair of Surface Areas. (Cited in paras 2-4, 2-5, 3-4, 3-15, and 4-13.)

TM 5-627

Maintenance of Trackage. (Cited in paras 4-13.)

TM 5-628

Railroad Track Standards. (Cited in paras 4-2, 4-4, and 4-5.)

TM 5-822-2

Walks, and Open Storage Areas. (Cited in paras 2-3 and 2-14.)

23 CFR 650

National Bridge Inspection Standards.

FEMA 64, Emergency Action Planning Guidelines for Dams

Federal Emergency Management Agency, Earthquakes & Natural Hazards Programs Division, 500 C Street, S.W., Room 502, Washington, DC 20472. (Cited in para 5-2, 5-15.)

FEMA 65, Federal Guidelines for Earthquake Analyses and Design of Dams

Federal Emergency Management Agency, Earthquakes & Natural Hazards Programs Division, 500 C Street, S.W., Room 502, Washington, DC 20472. (Cited in para 5-2.)

FEMA 93, Federal Guidelines for Dam Safety

Federal Emergency Management Agency, Earthquakes & Natural Hazards Programs Division, 500 C Street, S.W., Room 502, Washington, DC 20472. (Cited in para 5-2, 5-15, D-5.)

FEMA 145, Dam Safety

An Owner's Guidance Manual. Federal Emergency Management Agency, Earthquakes & Natural Hazards Programs Division, 500 C Street, S.W., Room 502, Washington, DC 20472. (Cited in para 5-2, 5-6, 5-9, 5-15.)

Bridge Inspector's Training Manual/90 July 1990, Department of Transportation, 400 7th Street, S.W., Washington, DC 20590.

Bridge Inspector's Manual for Movable Bridges Report No. FHWA-IP-86-10. 1977,

Department of Transportation, 400 7th Street, S.W., Washington, DC 20590.

Culvert Inspection Manual Report No. FHWA-IP-86-2, July 1986, Department of Transportation, 400 7th Street, S.W., Washington, DC 20590.

Emergency Relief for Federally Owned (ERFO) Roads Program Disaster Assistance Manual

Federal Highway Administration Publication No. FHWA/FLP98/005

Inspection of Fracture Critical Bridge Members Report No. FHWA-DP-80-1, September 1986, Department of Transportation, 400 7th Street, S.W., Washington, DC 20590.

Military Service and Installation Procedures and Responsibilities for Administering Emergency Relief Funds Guidance from Military Traffic Management Command (MTMC) for the Emergency Relief for Federally Owned (ERFO) Roads Program

Manual for Railway Engineering, Volumes I and II American Railway Engineering Association (AREA), Washington, DC.

Manual for Condition Evaluation of Bridges American Association of State Highway and Transportation Officials (AASHTO), 444 North Capitol Street, Washington, DC 20001.

Recording and Coding Guide for the Structure Inventory and Appraisal of the Nations Bridges.

Department of Transportation, Design and Inspection Branch, Bridge Division, Federal Highway Administration, 400 7th Street, S.W., Washington, DC 20590.

Standard Specification for Highway Bridges American Association of State Highway and Transportation Officials.

Underwater Inspection of Bridges Report No. FHWA-DP-80-1, November 1989, Department of Transportation, 400 7th Street, S.W., Washington, DC 20590.

TM 5-826-6

Army Airfield Evaluation. (Cited in para 2-8.)

TM 5-850-2

Railroad Design and Construction at Army and Air Force Installations. (Cited in para 4-2.)

Evaluating Scour at Bridges Hydraulic Engineering Circular (HEC) 18, Federal Highway Administration, Report No. FHWA-IP-90-017, Nov 1995.

Stream Stability at Highway Structures Hydraulic Engineering Circular (HEC) 20, Federal Highway Administration, Report No. FHWA-IP-90-014, Nov 1995.

Section II

Related Publications

A related publication is merely a source of additional information. The user does not have to read it to understand this regulation.

Architectural and Engineering Instructions (AEI) Design Criteria. Available from HQ US Army Corps of Engineers, Attention: CEMP-EA, 20 Massachusetts Ave, N.W., Washington, DC 20314-1000. It is also available on the Construction Criteria Base (CCB).

AR 420-70

Buildings and Structures. Federal Regulations 23 Highways, Part 650.305a (2 year bridge inspection req)

TM 5-801-1

Historic Preservation; Administrative Procedures

TM 5-803-4

Planning of Army Aviation Facilities.

FM 5-36

Route Reconnaissance and Classification.

Section III

Prescribed Forms

This section contains no entries.

Section IV

Referenced Forms

DA Form 337

Request for Approval of Disposal of Buildings and Improvements

DA Form 4283

Facilities Engineering Work Request

DD Form 1948

Traffic Engineering Needs Report

DD Form 1391

FY, Military Construction Project Data

Appendix B

Type of Bridge Inspections

B-1. Source

Derived from the American Association of State Highway and Transportation Officials' (AASHTO) Manual for Maintenance Inspection of Bridges.

B-2. General

a. Bridge inspections are conducted to determine the physical and functional condition of the bridge, to form the basis for the evaluation and load rating of the bridge, as well as analysis of overload permit applications, to initiate maintenance actions, to provide a continuous record of bridge condition and rate of deterioration, and to establish priorities for repair and rehabilitation programs.

b. Successful bridge inspection is dependent on proper planning and techniques, adequate equipment, and the experience and reliability of the personnel performing the inspection. Inspections should not be confined to searching for defects which may exist, but should include anticipating incipient problems. Thus inspections are performed in order to develop both preventive as well as corrective maintenance programs.

B-3. Type of Inspections

a. The type of inspection may vary over the useful life of a bridge in order to reflect the intensity of inspection required at the time of inspection. The five types of inspections listed below will allow an installation to establish appropriate inspection levels consistent with the inspection frequency and the type of structure and details.

b. Each type of inspection requires different levels of intensity. Such items as the extent of access to structural elements, the level of detail required for the physical inspection and the degree of testing will vary considerably for each type of inspections.

B-4. Initial Inspections

a. General. An Initial Inspection is the first inspection of a bridge as it becomes a part of the bridge file, but, the elements of an Initial Inspection may also apply when there has been a change in the configuration of the structure (e.g., widening, lengthening, supplemental bents, etc.) or a change in bridge ownership. The Initial Inspection is a fully documented investigation performed by persons meeting the required qualifications for inspection personnel and it must be accompanied by an analytical determination of load capacity.

b. The purpose of initial inspection is twofold.

(1) Provide all Structure Inventory and Appraisal (SI&A) data required by Federal and State regulations, and all other relevant information normally collected by the Bridge Owner.

(2) Determine the baseline structural conditions and the identification and listing of any existing problems or locations in the structure that may have potential problems. Aided by a prior detailed review of plans, it is during this inspection that any fracture critical members or details are noted, and assessments are made of other conditions that

may late warrant special attention. If the bridge subjected to an Initial Inspection is anything other than a newly constructed structure, it may be necessary to include some or all of the elements of an In Depth Inspection.

B-5. Maintenance Inspections

A maintenance inspection consists of a quick visual observation of the bridge by personnel to insure that nothing obvious has happened to the bridge that could affect its overall safety. Examples of this are: broken structural members or safety railings; leaning or settling piers or abutments; and major debris drift clogging the bridge hydraulic opening. This inspection has no specific requirements for frequency, inspector qualification, or reporting. It is intended only for in-house records and maintenance concerns.

B-6. Routine Inspections

a. Routine inspections are regularly scheduled inspections consisting of observations and/or measurements needed to determine the physical and functional condition of the bridge, to identify any changes from 'initial' or previously recorded conditions, and to ensure that the structure continues to satisfy present service requirements.

b. The Routine Inspection must fully satisfy the requirements of the National Bridge Inspection Standards with respect to maximum inspection frequency, the updating of Structure Inventory and Appraisal data and the qualifications of the inspection personnel. These inspections are generally conducted from the deck; ground and/or water levels, and from permanent work platforms and walkways, if present. Inspection of underwater portions of the substructure is limited to observations during low-flow periods and/or probing for signs of undermining. Special equipment, such as under-bridge inspection equipment, rigging or staging, is necessary for Routine Inspection in circumstances where its use provides for the only practical means of access to areas of the structure being monitored.

c. The areas of the structure to be closely monitored are those determined by previous inspections and/or load rating calculations to be critical to load-carrying capacity. In-depth inspection of the areas being monitored should be performed in accordance with Article 3.2.4. If additional close-up, hands-on inspection of other areas is found necessary during the inspection, than an in-depth inspection of those areas should also be performed in accordance with Article 3.2.4.

d. The results of a Routine Inspection should be fully documented with appropriate photographs and a written report that includes any recommendations for maintenance or repair and for scheduling of follow-up in-depth Inspections if necessary. The load capacity should be re-evaluated to the extent that changed structural conditions would affect any previously recorded ratings.

B-7. Damage Inspections

A damage inspection is an unscheduled inspection to assess structural damage resulting from environmental factor or human actions. The scope of inspection should be sufficient to determine the need for emergency load restrictions or closure of the bridge to traffic, and to assess the level of effort necessary to effect a repair. The amount of effort expended on this type of inspection may vary significantly depending upon the extent of the damage. If major damage has occurred, inspectors must evaluate fracture has occurred, inspectors must evaluate fractured members, determine the extent of section loss make measurements for misalignment of members and check for any loss of foundation support. A capability to make on-site calculations to establish emergency load restrictions may be desirable. This inspection may be supplemented by a timely in-depth Inspection as described below to document more fully the extent of damage and the urgency and magnitude of repairs. Proper documentation, verification of field measurements and calculations and perhaps a more refined analysis to establish or adjust interim load restrictions are required follow-up procedures. A particular awareness of the potential for litigation must be exercised in the documentation of Damage Inspections.

B-8. In-Depth Inspections

a. An in-depth Inspection is a close-up, hands-on inspection of one or more members above or below the water level to identify and deficiency(ie) not readily detectable using Routine Inspection procedures. Traffic control and special equipment, such as under-bridge inspection equipment, staging and workboats, should be provided to obtain access, if needed. Personnel with special skills such as divers and riggers may be required. When appropriate or necessary to fully ascertain the existence of or the extent of any deficiency(ies), nondestructive field-tests and/or other material tests may need to be performed

b. The inspection may include a load rating to assess the residual capacity of the member or members, depending on the extend of the deterioration or damage. Non-destructive load tests may be conducted to assist in determining a safe bridge load-carrying capacity.

c. This type of inspection can be scheduled independently of a Routine Inspection, though generally at a longer interval, or it may be a follow-up for Damage or Initial Inspections.

d. On small bridges, the in-depth Inspection, if warranted, should include all critical elements of the structure. For large and complex structures, these inspections may be scheduled separately for defined segments of the bridge or for designated groups of elements, connections or details that can be efficiently addressed by the same or similar inspection techniques. If the latter option is chosen, each defined bridge segment and/or each designated group of

elements, connections or details should be clearly identified as a matter of record and each should be assigned a frequency for re-inspection. To an even greater extent than is necessary for Initial and Routine Inspections, the activities, procedures and findings of in-depth Inspections should be completely and carefully documented.

B-9. Special Inspections

a. A Special Inspection is an inspection scheduled at the discretion of the Bridge Owner. It is used to monitor a particular known or suspected deficiency, such as foundation settlement or scour, member condition, and the public's use of a load-posted bridge, and can be performed by any qualified person familiar with the bridge and available to accommodate the assigned frequency of investigation. The individual performing a Special Inspection should be carefully instructed regarding the nature of the known deficiency and its functional relationship to satisfactory bridge performance. In this circumstance, guidelines and procedures on what to observe and/or measure must be provided and a timely process to interpret the field results should be in place.

b. The determination of an appropriate Special Inspection frequency should consider the severity of the known deficiency. Special inspections usually are not sufficiently comprehensive to meet NBSI requirements for biennial inspections.

Appendix C INSPECTOR QUALIFICATIONS

Section I Pavements

C-1. General

The individual responsible for pavement may be an engineer or technician that meet the below identified qualifications.

C-2. Qualifications of personnel

a. The individual in charge of pavements on an Army installation shall have at least one (1) year of experience in pavement maintenance or design.

b. Completed a training course on pavement maintenance or design within previous three (3) years of being assigned the responsibility for pavements or within one (1) year after being assigned.

c. Be recommended by a supervisor or Commander.

Section II Railroad Trackage

C-3. General

Army railroad track inspectors shall be qualified by MACOMs under guidance provided by ACSIM.

C-4. Qualifications of personnel

The individual in charge must:

a. Attend and pass the Army Railroad Track Maintenance and Inspection Course.

b. Have a minimum of one (1) year experience in railroad track maintenance work or design.

c. Be recommended by a supervisor or Commander.

d. Pass the Army Railroad Track Inspector Exam.

Section III Bridges

C-5. General

For reportable bridges, see definition in glossary. The below identified bridge inspector qualifications are required by Section 650.307 of the Code of Federal Regulations (CFR) 23 Highways-Part 650. For other bridges (non-reportable), the qualifications may be increased or decreased, by the bridge owner, depending upon the specifics of the individual bridge (e.g., age, condition, type of live loads)

C-6. Qualifications of personnel

a. The individual in charge of the organizational unit that has been delegated the responsibilities for bridge inspection, reporting and inventory shall possess the following minimum qualifications:

(1) Be a registered professional engineer; or

- (2) Be qualified for registration as a professional engineer under the laws of the State; or
 - (3) Have a minimum of 10 years experience in bridge inspection assignments in a responsible capacity and have completed a comprehensive training course based on the 'Bridge Inspector's Training Manual', which has been developed by a joint Federal-State task force and subsequent additions to the manual.
- b.* An individual in charge of a bridge inspection team shall possess the following minimum qualifications:
- (1) Have the qualifications specified in paragraph (a) of this section; or
 - (2) Have a minimum of 5 years experience in bridge inspection assignments in a responsible capacity and have completed a comprehensive training course based on the 'Bridge Inspector's Training Manual', which has been developed by a joint Federal-State task force.
 - (3) Current certification as a Level III or IV Bridge Safety Inspector under the National Society of Professional Engineer's program for National Certification in Engineering Technologies (NICET) is an alternative acceptable means for establishing that a bridge inspection team leader is qualified. Information on NICET program certification may be obtained from the National Institute for Certification in Engineering Technologies, 1420 King Street, Alexandria, Virginia 22314.

C-7. Bridge Inspector's Training Manual

- a.* The 'Bridge Inspector's Training Manual' may be obtained the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402
- b.* The following publications are supplements to the 'Bridge Inspector's Training Manual': 'Bridge Inspector's Manual for Movable Bridges,' 'Culvert Inspector's Training Manual,' and 'Inspection of Fracture Critical Bridge Member.'

Section IV Dams

C-8. General

Qualifications may be increased or decreased, by the dam owner, depending upon the specifics of the individual dam (e.g., type of inspection, age of dam, condition)

C-9. Qualifications of personnel

- a.* The individual in charge of the organizational unit that has been delegated the responsibilities for dam inspection, reporting and inventory shall possess the following minimum qualifications:
 - (1) Be a registered professional engineer; or
 - (2) Be qualified for registration as a professional engineer under the laws of the State; or
 - (3) Have a minimum of 5 years experience in dam inspection assignments in a responsible capacity and have completed a comprehensive training course on dam inspection.
- b.* An individual in charge of a dam inspection team shall possess the following minimum qualifications:
 - (1) Have the qualifications specified in paragraph (a) of this section; or
 - (2) Qualifications identified in FEMA document 93 for the specific type of inspection being conducted.

Appendix D

Program Agreement between the Army and The Federal Highway Administration for Compliance with the National Bridge Inspection Standards

D-1. PURPOSE

This Program Agreement between the Army and the Federal Highway Administration (FHWA) is to help ensure safety of bridges on public roads under the jurisdiction of the U.S. Government. This Program Agreement documents the processes and responsibilities of each agency to meet the requirements included in Title 23, United States Code, Section 151 (23 U.S.C. 151) for the National Bridge Inspection Standards (hereinafter referred to as NBIS).

D-2. PROCESS, RECORD KEEPING AND REPORTING REQUIREMENTS

- a. The Army.* The Army is responsible for meeting the staffing, inspection, and reporting requirements prescribed in:
 - (1) Title 23, Code of Federal Regulations, Part 650, Subpart C, Sections 650.301 through 650.311 (23 CFR Part 650, Subpart C, 650.301-650.311);
 - (2) FHWA Technical Advisory T 5140.21, Revisions to the NBIS;
 - (3) FHWA Technical Advisory T 5140.23, Evaluating Scour at Bridges;
 - (4) The Manual for Condition Evaluation of Bridges, American Association of State Highway and Transportation Officials, 1994, (AASHTO Manual); and

(5) The 'Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges' (Coding Guide) FHWA, December 1995.

b. In addition, the Army shall.

(1) Identify all bridges subject to the NBIS that are on Army roads open to public travel as defined in 23 CFR Part 460, Section 460.2(c);

(2) Process all data through the Edit/Update Program before transmittal to the FHW

(3) Correct all errors identified in the error list for the next annual NBIS submission;

(4) Document the NBIS processes and the quality assurance/quality control (QA/QC) procedures used to monitor the bridge inventory and inspection processes; and

(5) Submit annually FHWA Coding Guide data to FHWA's Federal Lands Highway (FLH) in accordance with the January 4, 1995, memorandum from the Chief, Bridge Division (Attachment 1).

(6) The Army may procure engineering services to assist in performing inspections, completing NBIS Coding Data, performing edit checks, submitting coding data, and documenting QA/QC procedures related to the NBIS.

(7) The Army shall annually submit to FHWA a list of all Army bridges on public roads, and all Army public road mileage in each State. (See Attachment 2 for a suggested reporting format.)

c. The FHWA. The FHWA shall ensure all Federal bridge-owning agencies meet the staffing, inspection, and reporting requirements prescribed in:

(1) 23 CFR Part 650, Subpart C, 650.301-650.311;

(2) FHWA Technical Advisory T 5140.21;

(3) FHWA Technical Advisory T 5140.23;

(4) The AASHTO Manual; and

(5) The Coding Guide.

d. The FHWA shall provide NBIS and public road bridge and mileage data to the States through organizational channels as prescribed in the January 4, 1995, memorandum from the FHWA's Chief, Bridge Division. The FHWA shall assist the Army, when requested, with establishment and documentation of their NBIS inspection and inventory processes, including establishment or review of QA/QC procedure. The FLH shall ensure compliance with the NBIS and shall provide other assistance as agreed between the Army and FLH as authorized under 23 U.S.C. 308(a). The FLH shall determine and allocate funding to the Army to cover the pro rata share of the annual estimate of costs for the inspection of Army bridges on public roads.

D-3. EXECUTION AND EFFECTIVE DATE

This Program Agreement will become effective on the date of the last signature. Either party to this Program Agreement may terminate participation upon written notice to the other party one hundred and twenty (120) days before the effective date of termination. This Program Agreement may be revised or amended at any time by mutual consent of both parties on 13 April 1999. R.L. Van Antwerp, Major General, U.S. Army Assistant Chief of Staff for Installation Management. And 3 June 1999. Arthur E. Hamilton, Manager Program, Federal Lands Highway Federal Highway Administration.

Appendix E Internal Control Provisions

E-1. Transportation Infrastructure Plan, Inspections, & Inventory Updates.

a. Evaluation Method. Installations prepare Annual Work Plan, Five Year Long-Range Plan, inspections and Inventory of Transportation Infrastructure. MACOMs review onsite triennially and report inventory updates to ACSIM, annually by 1 January, IAW chapters 2, 3, & 4

b. Objective. Compliance with statutory (23 CFR Part 650, C 301-311); Federal Highway Administration (FHWA) Program Agreement; & Army regulatory controls for Pavements, Airfields, Rail, & Bridges.

c. Internal Control Reports. The MACOMs shall report each installation status of preparing, updating and compliance with the installation Transportation Infrastructure Plan, Inspections, & Inventory Updates to ACSIM Facility Policy Division annually by 30 June

E-2. Army Dam Plan, Inspections, & Inventory Updates.

a. Evaluation Method. Installations prepare Annual Work Plan, Five Year Long-Range Plan, inspections & Inventory of dams. MACOMs triennial review onsite and report inventory updates to ACSIM, Biannually by 5 January on each odd number year, IAW chapter 5.

b. Objective. Compliance with statutory (National Dam Safety Program Act); Federal Emergency Management Agency (FEMA); & Army regulatory controls.

c. Internal Control Reports. The MACOMs shall report each installation status of preparing, updating and compliance with Army Dam Plan, Inspections, & Inventory Updates to ACSIM Facility Policy Division annually by 30 June.

E-3. Condition assessment of existing roads, parking, rail track, airfields, & piers.

a. Evaluation Method. Installation Commanders shall prepare Installation Status Report (ISR) and forward through MACOMs to ACSIM annually by 15 May.

b. Objective. Assess conditions against Army-wide standards, identifies shortcomings, & provides visibility to Installation conditions and priorities. Applies objective, Army wide facility funding & quality delivery conditions.

c. Internal Control Reports. The MACOMs shall report each installation status of preparing, updating and compliance with Condition assessment of existing roads, parking, rail track, airfields, & piers to ACSIM Facility Policy Division annually by 30 June.

Glossary

Section I Abbreviations

AASHTO

American Association of State Highway and Transportation Officials

ACSIM

Assistant Chief of Staff for Installation Management, Facilities Policy Division (DAIM-FDF)

AE

Architect/Engineer

AEI

Architectural and Engineering Instructions

AREA

American Railway Engineering Association

ARR

Annual Recurring Requirement

ASTM

American Society for Testing and Materials

AWP

Annual Work Plan

AWPA

American Wood Preservers Association

BMAR

Backlog of Maintenance and Repair

CBR

California Bearing Ratio

CEGS

Corps of Engineers Guide Specifications

CONUS

Continental United States

DA

Department of the Army

DEH

Directorate of Engineering and Housing

DOD

Department of Defense

DOL

Directorate of Logistics

DPW

Directorate of Public Works

EUAC

Equivalent Uniform Annual Cost

FOA

Field Operating Agency

FEMA

Federal Emergency Management Agency

FHWA

Federal Highway Administration

GOCO

Government-owned, contractor-operated

GSA

General Services Administration

HSPS

Highway Safety Program Standards

IFR

Integrated Facilities Report

IFS

Integrated Facilities System

IJO

Individual Job Order

M&R

Maintenance and Repair

MACOM

Major Army Command

MCA

Military Construction, Army

MILCON

Military Construction

MSC

Major Subordinate Command

MTMC

Military Traffic Management Command

MTMCTEA

Military Traffic Management Command Transportation Engineering Agency

MUTCD

Manual on Uniform Traffic Control Devices

NDT

Non-destructive Testing

NEPA

National Environmental Policy Act

NICET

National Institute for Certification in Engineering Technologies

O&M

Operations and Maintenance

OCE

Office, Chief of Engineers

OCONUS

Outside Continental United States

OCSLOG

Office, Deputy Chief of Staff for Logistics

OMA

Operation and Maintenance, Army

OSHA

Occupational Safety and Health Administration

PCI

Pavement Condition Index

PMO

Provost Marshall/Security Officer

PMP

Pavement Management Plan

PPBES

Planning, Programming, Budgeting and Execution System

RMP

Resources Management Plan

ROTC

Reserve Officers' Training Corps

RPF

Real Property Facility

UAWP

Unit Annual Work Plan

URR

Unconstrained Requirements Report

URWP

Unit Recurring Work Plan

USACE

U.S. Army Corps of Engineers

Section II**Terms****Asphalt pavement recycling**

The reusing of the two basic components of the original pavement surface, the aggregate and the asphalt, in the rehabilitated or upgraded pavement, either in the base course or the surface course.

Associated appurtenances

All associated features to the pavement, bridge, or railroad. Pavement and bridge appurtenances consist of such items as ditches, culverts, and storm sewers; traffic signs, signals, markings; right of way or snow fencing; unstabilized

shoulders; curbs; guard rails; cattleguards; tank crossings; and supporting embankments. Appurtenances for airfields include overrun areas, aircraft arresting gear, and tie downs in addition to the items listed above. Railroad appurtenances include roadbeds, road crossings, tracks, culverts, other drainage structures, signs, signals, switch tafetts, lamps, safety devices, track scales and all other features and items necessary to meet operational and safety requirements. Railroad communications systems and rolling stock are excluded.

Bridge

a. General. A structure including supports erected over a depression or obstacle such as a river, chasm, road or the like, carrying a passageway for pedestrians, vehicles, or railway equipment.

b. Reportable Bridge.

(1) A CONUS structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a passageway for carrying vehicular traffic,

(2) On a road section classified as open-to-the-public,

(3) Having an opening measured along the center of the roadway of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes. It may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.

Closed to the public

In general, installation roads and bridges are considered closed to the public if they are located in high security and permanently restricted areas all of the time.

Major culvert

All culvert, multi-plate, and arches with an end area equal to or exceeding 200 square feet. Open to the public

a. Means that the road section is available for public use, except during scheduled periods, extreme weather or emergency conditions, passable by four-wheel standard passenger cars, and open to the general public (e.g., dependents, retirees, visitors) for use without restrictive gates and prohibitive signs, or regulation other than restrictions based on size, weight, or class of registration.

b. In general, most installation roads and bridges are considered open to the public. These roads serve housing, offices, commissaries, post exchanges, recreation facilities (fishing or hunting areas), unrestricted training facilities, cemeteries, hospitals, and traffic crossing an installation.

Pavement

Surfaced area designed for vehicular or aircraft use.

Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment, utility plants and systems, building and structures, and ground facilities for the purpose of detecting and correcting incipient failures and accomplishing minor maintenance.

Roads in the 50 States and U.S. possessions

a. Installation road. A road or street within the boundaries of a military installation or in which the Department of Defense has a real estate interest. It is not dedicated for public use and is not eligible for improvement with Defense Access Road funds (AR 55-80).

b. Pubic road (on-post or off-post). A road or street which is owned, operated, and maintained by a civil authority. These include those through a military installation when they are dedicated to public use.

c. Joint-use roads. A road or street which by lease, permit, easement, or other agreement is used and / or operated by the Army jointly with an individual(s) or civil authority. (A joint-use road may or may not be open to public traffic.) Maintenance of these roads will be in accordance with the terms of the agreement, which should include appurtenances as defined in (1) above. Where the Army has maintenance responsibilities, the area associated with this responsibility will be included in the installation real property records inventory.

d. Defense access road. A public owned road that is authorized to be improved in whole or in part with Federal funds appropriated for defense access roads under the authority of 23 USC 210. Policies applicable to Defense Access Roads are prescribed in AR 55-80.

Roads outside the 50 States and U.S. possessions

- a. Installation road.* A road within an area designated for exclusive use of the U.S. Army by agreement or treaty.
- b. Public road.* A road outside or through areas set aside for U.S. Army use for which the U. S. Government is not obligated by agreement or treaty to maintain or repair.
- c. Joint-use road.* A road used by the U.S. Army and the public for which the U.S. Government is obligated by agreement or treaty to share in the maintenance and repair.

Surfaced areas

Surfaced areas are structural systems constructed to support and sustain various types of traffic and loadings and normally include drainage features and an established profile or template. Surfaced areas include, but are not limited to vehicular and aircraft pavements (including parking areas), sidewalks, open storage areas, cargo handling areas, and equipment hardstands. Structural systems may consist of compacted subgrade, improved materials (subbase), interlocking aggregate base course and flexible or rigid surface or wearing course. Included within this definition are stabilized areas and so called 'unsurfaced' roads and parking areas consisting of compacted subgrade and gravel or aggregate base and wearing course. It does not include grass, graded areas, or road tracks established by passage of vehicles.

Track

All Army-owned railroads used for transporting personnel and material. Crane tracks and tracks on target ranges do not fall under the purview of this regulation.

Stabilized area

Areas which have been improved from their natural condition by mechanical compaction with or without the addition of stabilizing agents such as calcium chloride, and lime. Tank trails, footpaths, unimproved open storage areas, firebreaks, and other locations are not considered to be stabilized areas.

Section III**Special Abbreviations and Terms**

This contains no entries.

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